



Area 3 - Responsible Architecture

EU consultation on the evaluation of the Energy Performance of Buildings Directive (EPBD)

Response of the Architects' Council of Europe

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A. OVERALL ASSESSMENT

1. How successful has the EPBD been in achieving its goals?

The EPBD has created a good framework for the improvement of energy performance of buildings and has ensured that buildings now have a more prominent role in energy policy. However emerging evidence shows that the effects of improved fabric efficiency have in many cases been offset by inefficiently designed, coordinated, installed and operated building services. By not regulating achieved building performance, including the reporting of operational energy use and indoor environmental quality, the EPBD has resulted in significant unintended consequences, which have challenged the credibility of the directive. NZEBs are also poorly understood. There remains a performance gap between the potential of the legislation on paper and the reality on the ground in many MS. As a result, energy consumption in most sectors has stayed level or increased while indoor environmental quality suffered. On new projects and refurbishments there is significant financial pressure for architectural determinants to building performance to be side lined and value engineered, which the regulations do not prevent in any way. This often leaves building end users with bolt-on mechanical solutions that are poorly integrated and fragile with high maintenance costs and a short life-span. The EPBD's aim, to maximise a building's passive potential first, is not supported by the way in which the energy consumption of a building is calculated and benchmarked from design to operation. In practice, construction quality, commissioning, handover and maintenance pose a very high risk to operational building performance. As the current legislation does not adequately account for this risk, project teams are not required to plan for this. As EPC do not incentivise holistic solutions to building performance, they are perceived in many MS as a tick-box exercise. They are often inaccurate and suffer from a lack of quality control and robust accreditation of installers. EPCs would gain significant credibility in the property industry if they were linked to achieved improvements in energy consumption, indoor comfort, reduced maintenance cost and longer building life span. To achieve a step-change in EU building performance, a mechanism that mandates feedback from buildings in operation, has to sit at the heart of the legislation. To support this, the calculation of energy performance, set out by the EPBD, need to be transparent from 'design' to operation and the data produced tracked and benchmarked.

2. Has it helped to improve energy efficiency in buildings?

Yes, the EPBD has succeeded in creating a much stronger focus on the potential for improving the energy performance of buildings and has promoted tools and concepts (e.g. EPCs, nZEBs) to drive forward improvements in the building stock. Despite the fact that implementation of the directive coincided with a difficult economic situation in most MS, the improvement in national regulations has stimulated innovation in the construction sector. Moreover, the buildings sector is now acknowledged to play a key role in reducing energy demand and GHG emissions, while at the same time delivering economic and social benefits (jobs, growth, less fuel poverty, better physical and mental health, etc.).

Despite its shortcomings it has demonstrated that regulation is the most powerful driver for change in the property sector when it comes to energy efficiency. The EPBD has great untapped potential. Improving the connection between technical and architectural approach to energy efficiency would result in more holistic and resilient built environment.

Architecture has a major influence on occupants' perception of comfort and productivity and therefore the amount of energy used to achieve this. Socio-technical methods of analysis and



design offer long-term cost-efficient solutions to waste, pollution, upkeep and fuel poverty while impacting positively on health and wellbeing – and should be supported accordingly by the directive. Incentivising holistic solutions by recognising the interconnection between energy efficiency and architectural design would significantly increase the uptake of energy efficiency measures and raise the overall sustainability of the built environment sector.

3. Has it helped to increase renovation (more than 25% of the surface of the building envelope) rates?

It is commonly acknowledged that the annual renovation rate of the EU building stock is too low (1,4% on average) and the main barrier is the lack of adequate financial incentives: payback times alone are far too long for a minimal financial and performative gain. The current legislation has resulted in an unhelpful disconnect between the spatial and performative renovation of buildings. A combined architectural and performative upgrade of a building would offer

Moreover, energy efficiency in itself is not perceived to significantly contribute to a property's value as the benefits are not tracked against occupants' perception of a building's architecture and indoor environmental quality. This is in part due to the unfortunate de-coupling of the architectural design of a building from its potential performance. This is exacerbated by a disconnect between EPC ratings and actual operational performance, where the validation of expected performance is not enforced by the EPBD framework.

There is some evidence that buildings designed with operational performance targets and rigorous enforcement of these benefit users' perception of comfort, usability and health but not enough data is available to prove this connection in a statistically significant manner yet. A re-cast of the current directive is required to close this loop and increase the evidence base.

The financial instruments for energy efficiency retrofit should further incentivise an overall architectural upgrade of a building in order to achieve a magnitude growth of the retrofit sector.

4. In your view, has the EPBD sufficiently contributed to accelerating investment in improving the energy performance of the EU's building stock? Why/Why not?

The feedback from our member organisations varies. Some countries, such as Denmark, have seen improvements in the performance of new buildings – this has not been matched by the retrofit sector. Research into the gap between the expected and achieved performance of buildings also highlighted the urgent need to target operational performance more effectively. 75% of the EU's building stock is not energy efficient and ACE advises a change in the EPBD to improve incentives to meet this challenge.

ACE advocates that financial instruments for energy efficiency are extended to the architectural renovation of existing buildings – with the achieved operational performance (energy and comfort) of buildings disclosed as part of compliance with the EPBD.



5. Overall, do you think that the EPBD is contributing to cost-effective improvements in energy performance? Why/Why not?

Post-occupancy studies have demonstrated that the dominance of technological solutions employed to achieve regulatory compliance is often not cost effective, neither on a capital nor a whole life basis. Without the requirement to report operational performance the architectural determinants for building performance are under-valued and frequently value engineered. These low maintenance features are mostly replaced by difficult-to-use technical solutions to control active building services supplying heating, cooling and ventilation on a demand control basis. However the expertise required to design, install, commission and operate these is not recognised by current regulations and is usually not planned for – as a result systems and their controls are often poorly installed, under-utilised in operation and cost more to maintain, leading to loss of profit and productivity across the supply chain.

The ACE emphasises the importance of design studies, which offer long-term cost-effective energy-saving solutions. The ACE advocates that priority should be given to simple, passive, low-tech, locally tested oriented solutions that do not consume energy and are less prone to human error. The ACE calls on the EU institutions to recognise and promote the contribution of architects to energy efficient construction in the EPBD.

The EPBD should promote the architectural determinants of energy efficient buildings as well as mandate the reporting of achieved operational energy performance. Architects can influence the way in which energy is used and perceived by occupants in the long term through the spatial configuration of their environments. Incentivising more holistic solutions and interlinking financial instruments for energy efficiency with architectural design solutions would significantly increase the uptake of energy efficiency measures.

6. Do you think that the aim of ensuring the same level of ambition across the EU in setting minimum energy performance requirements within the EPBD has been met? Why/Why not?

No, the transposition of the EPBD into national law varies a lot from one MS to another and depends on political will to implementation in the member states.

7. Has the EPBD effectively addressed the challenges of existing buildings' energy performance?

The EPBD has laid down helpful principles and set in motion a number of helpful and influential measures. Some aspects of Energy Performance Certification have also been useful. However the EPBD has not been successful in supporting and encouraging the improvement of performance of existing buildings. The capital cost of comprehensive building performance upgrades are still significant and form a barrier to their implementation. Financial instruments that can overcome this barrier are currently absent but essential for such interventions to become common.

Article 7 limits the interventions to what “is technically, functionally and economically feasible”. More clarity and guidance on what is technically and functionally feasible are necessary. The caveat of Article 4 which stipulates that “A Member State shall not be required to set minimum



energy performance requirements which are not cost-effective over the estimated economic lifecycle.” allows for interpretation of what is meant by “lifecycle” and “cost-effective”. The lifecycle has to be specified in relation to past records and differentiated by building type and the cost-effectiveness has to consider non-monetary aspects as well. For instance, Article 7 does not consider improved comfort and healthy environments that result from comprehensive and radical building performance retrofit interventions. The advantages of a comprehensive retrofit are therefore not fully highlighted and the cost benefit calculations are typically not supportive of the investment required for comprehensive upgrades.

8. Has the EPBD set effective energy performance standards for new buildings?

Yes, it has instigated the continuous updating of the technical regulations on energy efficiency of the building stock in most Member States. However these regulations are diverse and in most cases stop short of effectively tackling major risks to effective operational performance.

9. Will the ‘nearly zero-energy buildings’ targets be met? Why/Why not?

The objectives of the nZEBs are achieved in some MS. However in a 2013 report, the Commission concluded “that too little progress has been made by the MS in their preparations towards NZEBs by 2020. This lack of proper and timely preparation increases the risk that MS will not meet the deadlines for new buildings to be NZEBs. Moreover, the absence of clear definitions, interim targets and dedicated support measures means that the building sector faces uncertainty over the regulatory and policy framework for NZEBs, thus delaying the necessary investments in technology, processes and training, and reducing its competitiveness. This lack of progress also implies that MS are struggling to put in place a detailed practical definition of NZEBs within the scope of the EPBD, which further increases the uncertainty for the building sector. Finally, since the Commission has received only limited information from the MS, it is not possible to undertake a proper evaluation of the national plans, and in particular of the adequacy of the measures envisaged by the MS in relation to the objectives of the EPBD”.

Since then many member states have been unable to achieve the objectives due to lack of political momentum to implement the necessary measures and, above all, assuming the exemplary role of public administration. The states that have successfully implemented nZEB standards are moving towards regulating overall resource efficiency. In these countries the focus on energy in operation is gradually shifting towards life cycle assessments (LCA) of materials, components and whole buildings in the future, integrated with the application of Life cycle costing (LCC) for budgeting, pricing and tendering of construction projects.

10. How successful has the inclusion of Energy Performance Certificates in the EPBD been? Have the certificates contributed to improvements in energy performance of buildings?

The introduction EPCs have helped the consumer and investor, to consider energy efficiency of buildings. EPCs are also beginning to have some impact on property prices. As a result of EPCs, technical regulations relating to energy efficiency have been upgraded across the EU. However the impact of EPCs on property prices has been marginal and the impact of EPCs on the existing stock have not been significant either. The Minimum Energy Standards coming into force in 2018



have had some impact on larger portfolio holders, including public bodies. However it is widely perceived that changing a building's rating from G or F to E does not require a significant undertaking. It is also disputed whether an improvement in ratings would result in lower actual energy consumption.

11. What has worked well in the EPBD? What needs to be improved?

The EPBD has set some clear principles and targets for the performance of new buildings. However the overall the requirements are relatively flexible and these need to be made more specific and recast in an overall framework that focuses on the reconciliation between design expectations and actual outcomes. A clear and firm roadmap is required for the implementation of changes so that industry can plan ahead in terms of investment and expected returns. It may be useful for the EPBD to include penalties for MS missing intermediate targets to avoid a situation where it is physically impossible to achieve the final targets. (see UK delays to the implementation timetable). In addition the directive needs to provide more clarity on the following, as summarised by the Coalition of Energy Savings:

- EPCs must be reinforced to have a more transparent relationship to actual energy use and their quality ensured, so as to become a real trigger and stimulus for the renovation of our building stock and create an environment where energy performance contracting can flourish;
- More clarity and guidance on NZEB definitions and conditions is needed, while still allowing flexibility on the side of MSs;
- Include provisions that support energy efficiency improvements of the existing building stock including the (deep) renovation as well as operation and maintenance.
- Improvement of implementation at MS level and enforcement at EU level of current legislation;
- Stable finance mechanisms for renovation of buildings;
- Include wider societal benefits in the assessment of benefits of the building stock;
- Stimulate initiatives to drive up the renovation rate and depth of buildings in the EU, including a revision of the EED;
- Make more use of ex-ante conditionalities and conditions for EU and EIB funds;
- Recognise the architectural / design determinants of energy efficient buildings
- More transparent and harmonised reporting and benchmarking of building energy use

The ACE calls for a more transparent and harmonised reporting and benchmarking of building energy use; for the disclosure of building operating performance across all sectors; for the implementation of measurement and verification of energy performance in use; for EPCs to meet market needs and have a transparent relationship to actual energy use; for transparent reporting by MS on building level performance indicators.

12. Is the EPBD helping to contribute to the goals of EU climate and energy policy (Reduce greenhouse gas emissions by at least 40%; increasing the share of renewable energy to at least 27%; increasing energy efficiency by at least 27%; reform of the EU emission trading system)?

Yes it is by improving fabric efficiency and highlighting the importance of demand control for providing heating, cooling, lighting and appliance use. Where it is less successful, is implementing a feedback loop between designed and achieved performance, recognising the



importance of coordinated architectural design and achieving priority for passive measures in practice.

A more robust EPBD that that is well implemented in MS would provide an effective mechanism to achieve this.

See also response to Q29.

13. Is it in line with subsidiarity? What should continue to be tackled at EU level and what could be achieved better at national level?

To empower built environment professionals across the EU to take more effective action, the ACE calls for a more transparent and harmonised reporting and benchmarking of building energy use; for the disclosure of building operating performance across all sectors; for the implementation of measurement and verification of energy performance in use; for EPCs to meet market needs and have a transparent relationship to actual energy use; for transparent reporting by MS on building level performance indicators.

In addition, setting shared long-term goals at EU level is essential to ensure that the innovation effort of industries that the goals are clear and will not change with each election period. At national level, it is important to regulate the level of requirements as well as the financial funding schemes and to inform building owners and end users. The standards for calculation should continue to be tackled at EU level (CEN), whereas only the level and the way of expressing requirements should be a national matter.

More concise and prescriptive guidance should be made available to member states on the above. Sharing of best practice should be incentivised by requiring the disclosure of key common indicators for overall building performance.

Research and Development efforts in analysing and utilising the data from as designed and as built projects should be further.

14. Are the objectives of the EPBD delivered efficiently?

The objectives of the EPBD have been delivered in only a few MS (e.g. Germany, Denmark) inefficiently in many (e.g. Britain, Spain, Italy) and not at all in many (e.g. Belgium).

15. Has the EPBD created any unnecessary administrative burdens? If so, please provide examples

Yes, this is mainly due to the individual interpretations of member states. The EPBD recast missed the opportunity to mandate the disclosure of operational performance of buildings according to transparent and comparable metrics. This would have resulted in a step change in investment to predict actual consumption more effectively and tackling the risks of underperformance in operation.



16. Has the EPBD created any unnecessary regulatory burdens? If so, please provide examples

Any new regulations and changes in the practice will increase the administrative or regulatory requirements but the burden was not more than for any other changes in the industry. Compliance is recognised as being of critical importance in achieving the full energy efficiency and carbon savings potential of buildings. Strong local and regional verification of compliance with national building codes is required in order to reassure consumers of the quality of buildings.

The burden currently is having to calculate and benchmark a building's performance that has little relation to its actual operating performance. This also results in poorly targeted investment in energy efficiency measures as well as research and development.

The ACE strongly advocates the mandatory disclosure of operational building performance (energy and indoor comfort data) to allow MS to improve the effectiveness of national regulations. MS should be required to make use of the data collected from operating buildings to evaluate the effectiveness of the regulations to achieve step change in building performance. Such a feedback mechanism is essential for MS to be able to remove regulatory burden that does not deliver significant improvements in actual building performance while better targeting areas (e.g. architectural design, control systems, commissioning, etc). that are not adequately supported.

B. FACILITATING ENFORCEMENT AND COMPLIANCE

17. Is compliance with the provisions of the EPBD adequate?

No, A step change is required to upgrade the energy performance in existing buildings and achieve nZEB new buildings in order to achieve the carbon reduction targets. A more effective targeting of operational performance is needed and the ACE argues for 'disclosure' of key building performance indicators to be at the heart of this approach. Mandating disclosure and adopting metrics that are directly related to operating performance, maintenance costs and comfort is likely to significantly improve uptake while reducing regulatory burden.

ACE agrees with the BPIE's response:

There is a need to consistently improve the enforcement of the EPBD provisions in Member States and strengthen the monitoring of the compliance both at Member State and European levels. For instance, only 50% of the MS have a view on the compliance rates of new buildings with energy performance requirements, which is highly problematic. It is a major barrier for policy making (on European, National and Regional level) and it is damaging to the credibility of the EU and the EPBD. Member States should secure the adequate administrative, institutional, financial and human resources, especially for some specific processes such independent control system (i.e. including the Option C from the Annex II of EPBD) and enforcement of effective, proportionate and dissuasive penalties for non-compliance.



18. Is the definition of NZEBs in the EPBD sufficiently clear?

No, the definition of the EPBD is ambiguous and leaves Member States making many decisions. Buildings vary in nature and more building-specific requirements should be included. It is critical to require the most efficient performance that can be expected within a specific context and that means avoiding general and flexible requirements and including more specific requirements.

For example many member states, including the UK have not concluded on what measures could be accounted for as 'allowable solutions'. This should not be up to member states. Accounting for different sources of energy and how it is used in a building (energy end uses) should be harmonised across the EU.

By mandating the disclosure and collection of building level data along with key building properties that contribute to building performance, it will become possible to determine what level of energy consumption and associated CO₂ emissions can be considered nZEB for different building types in different locations with different intensities of use.

A clearer definition of the desired energy performance of a nearly Zero-Energy Building in the European legislation would support a more coherent approach by the national governments. In consequence, this would trigger more innovation in the field and support a technology leadership of Europe in the field. The question how "close to zero energy" the buildings will be in reality remains open and requires monitoring of existing and future nZEBs.

19. Is the NZEB target in the EPBD sufficiently clear to be met?

Yes. The target is clear but not specific enough. The target can be met but the resulting building solution may not be the best practice possible. As suggested in no.18 it is critical to be more specific about the requirements, including the contribution from the energy efficient fabric and building design and the contribution from the services and renewable sources of energy. Overreliance on services and renewable sources of energy for compliance with the NZEB target would increase the challenge of achieving the required carbon reductions at a settlement scale. The focus on individual buildings is sound but the impact of solutions at a building scale have to be considered also at a settlement scale.

There should be a greater convergence in national quality control requirements, as well as in national definitions with the introduction of some benchmark values in order to facilitate cross-national comparability. The Energy Efficiency First principle shall be applied in defining nZEBs, which are in essence low energy demand buildings, and a link to EPCs, access to financing and cost-optimal levels, shall be made.

See mechanism suggested under Q18.



20. If not, what, in your view, are the missing factors that would ensure compliance with:

a. Minimum energy performance requirements in new buildings?

The key missing factors are energy consumption targets in kWh/m² and occupant for different building types. These numeric targets have to be related to the climatic context and consider future climates. These should be supported by data and evidence of what level of performance can be achieved at what costs, the relating maintenance costs and relationship to occupant well-being. The annual reporting of operational energy use (by end use) should be mandated for all sectors.

In some countries, such as Denmark, the establishment of an independent commissioning process has resulted in smaller performance gaps.

New incentives, in the form of financial instruments linking energy efficiency to architectural quality and well-being should be developed to overcome the challenge of non-compliance and scepticism.

The ACE agrees with the BPIE's response:

Compliance for new buildings is usually higher than for existing buildings but in some countries (e.g. Italy), input data for calculation are based on the situation at the design stage, with the consequence that changes occurring during the construction phase are not being reflected in the EPC. Better control should be performed during and after construction phase and, as it is already in some countries (i.e. Sweden, Belgium), a mandatory EPC after finalising the building (based on updated and reviewed information) should be issued. The as-built EPC should also require the declaration of likely actual energy use, taking into account likely patterns of use – based on data collected from buildings in use for key typologies. Some European projects have demonstrated that better information sharing during the construction phase (i.e. through IT solution and protocols such as BIM) reduces considerably the errors during the construction phase. Other examples (e.g. Belgium) outline the importance of a database with the characteristics of building products.

The development of 'digital building passports' that combine building characteristics from BIM models with automated energy data from AMRs and submeters should be actively pursued and their use incentivised by the directive.

Lastly, the directive should set a time-scale for a building's energy consumption to be declared in the context of its embodied energy and carbon footprint.

b. Minimum energy performance in major renovations of existing buildings?

Views of MS seem to differ on this point, however there is strong convergence on the recommendations stated under point 20a as well as on the need to further clarify what 'major renovation' constitutes. Renovation targets should be defined clearly and should directly address unintended applications of the provisions regarding major renovation. The gathering of standardised large scale data from completed renovations must guide the development of local benchmarks for minimum performance, which must take into account local climatic and building traditions.



c. Minimum energy performance for the replacing/retrofitting parts of the building envelope (roof, wall, window, etc.) and replacing/upgrading/installing technical building systems (heating, hot water, cooling, etc.)?

Minimal energy performance for building elements and services is essential and should be considered as part of a comprehensive upgrade even if only a part of the comprehensive upgrade takes place. Every energy efficiency upgrade should be logged through an EPC or in the building's 'passport' by an independent assessor. In order to keep compliance monitoring costs low, EPC review checks should be taking place in regular intervals after the initial issuing of an EPC. Logging the resulting performance in a public database should be rewarded and building occupants/managers should be able to authorise energy providers to enter energy data automatically.

An implementation plan for digital building passports should be developed by MS using harmonised metrics.

Quality assurance scope: checks by qualified certifiers should also be aimed at assessing whether the works the building underwent comply with the requirements. Confirmation of the undertaking should trigger financial rewards.

d. Minimum renewable energy requirements to meet the NZEB target by 2020?

Offsite solutions should not be encouraged or allowed where onsite solutions can be provided. Clarity should be provided on what qualifies as 'allowable solutions'.

ACE agrees with the BPIE's response:

Better guidelines have to be set to improve the understanding of the contribution of renewable energy sources in NZEB buildings.

First, the definition of "nearby" (EPBD, article 2.2) has to be clarified since some MS include in the balance renewable energy provided by the grid (i.e. Denmark and England) while in other countries more constraints are established on the contribution of renewable energy sources (e.g. integration of PV in German EPB calculations). In addition, the balance period to determine self-use varies between monthly (i.e. Italy, Slovenia, Flanders, Czech Republic, Germany and Austria) and yearly (i.e. UK) basis.

At the same time, a connection should be made with the minimum levels of renewable energy according Art 13.4 in the RES-directive. In some MS (i.e. Austria), the contribution of renewable energy source is not so determinant to achieve the status of NZEB and this is also a reason why independent requirements on energy demand, final energy used and renewable energy supplied should be put in place and benchmarking for all three developed in the manner similar to the US Energy Star programme.

e. Certification of the energy performance of buildings, including tailor-made recommendations for the improvement of the energy performance of buildings?

Aside from a 'rating' EPCs for existing buildings must include a record of annual operational energy consumption and an estimate of what the building should be consuming, given its operating



conditions, against which achieved consumption can be compared.

Recommendations should be made for all energy-consuming buildings by qualified EPC certifiers.

EPC, if transformed as above, have the potential to become digital “building passports” accompanying a building through its life cycle and include improvement proposals and energy renovation activities (in a step-by-step approach). Indeed, in order to become useful in individual buildings’ improvement plans, EPC should evolve towards more comprehensive, dynamic tools accompanying a building over its lifetime. A ‘building passport’ should eventually include the results of occupant satisfaction survey, comfort readings and a record of key architectural determinants to building performance, alongside a simple building manual for occupants, a diagrammatic illustration of a building’s services strategy, the zoning of the building and key routing and location of building services as well as key contributing factors to energy efficiency (openable area of windows, etc.). A monitoring plan, alongside simple instructions to extract data from BMS and submeters should also be included.

Quality of the certifiers: There needs to be a harmonised system across EU MS that sets minimum standards for certifiers’ training and their professional experience. Mandatory examination of competences is crucial and it should be offered by independent certification entities. The EU COM should come forth with a detailed guidance on the necessary competences of certifiers and the system of accreditation. The role of architects in the certification process should be clarified.

Monitoring: EPC and operational energy use databases, based on harmonised metrics, should be set up in all MS with the purpose of ensuring monitoring and compliance. The EU COM has to examine the experience of different Member States in regards to the systems of monitoring, compliance and quality check and set database guidelines according to best practices. The anonymised data should be made available for research purposes across the EU.

Transactions: A building or building module belonging to any category should be required to have an EPC during commercial transactions. Exceptions could be made for religious buildings, archaeological sites, temporary constructions, etc.

f. Regular inspections of heating and air conditioning systems?

This is already a requirement but is generally poorly enforced. The inspection in itself should not require a replacement of the equipment if found to be inefficient.

21. Do you think the cost-optimum methodology gives sufficient evidence regarding the actual cost of renovating buildings on top of the additional cost for Near Zero-Energy Buildings?

No, these should remain a central part of the EPBD with a greater convergence in the use of metrics and calculation methodologies to increase comparability across nation states. The life-cycle approach should be introduced to all cost-benefit analyses.

See response of the Coalition for Energy Savings:

Concerning cost-optimal requirements, compliance with EPBD could be greatly boosted. Cost-optimal methodologies, which have proven to be and should remain a central part of the EPBD,



have driven Minimum Energy Performance Requirements in some Member States. Recommendations for improvement include a greater convergence in the use of parameters, more transparency at Member State level to allow comparability, and the introduction of a lifecycle approach in all cost-benefit analysis so as to take into account wider long-term societal benefits.

22. Are there any cost-effective measures for ensuring compliance at local and regional level that could be replicated and used to improve compliance on a larger scale?

BPIE has detailed specific measures that would improve the quality of EPCs, which ACE supports. In addition, the ACE calls for:

- the creation of a transparent and harmonised framework for reporting and benchmarking of building energy use and building performance indicators from design to operation;
- the implementation of harmonised measurement and verification protocols for energy performance in use;
- the EU-wide disclosure of building operating performance across all sectors.

The most important challenge for EPCs and nZEBs is to be perceived as common sense standards that raise occupant satisfaction and building value. This can only be achieved if the regulations have a closer relationship to actual building performance that enable the easy targeting of operational energy use (as opposed to a building's 'energy performance potential' under standardised conditions) via a performance contract.

BPIE

There is a need for a consistent monitoring of the compliance measures. Based on the analysis of field studies and existing approaches, several aspects could be relevant to improve enforcement and compliance, including:

· At national or local level, compliance and quality of the works frameworks should clarify 3 fundamental aspects: the procedures to achieve compliant buildings and prove compliance; the legal framework to check compliance; the enforcement in practice. Experience shows that in many MS, one or several of these aspects are neglected.

· Checking EPCs after completion of the works (as for instance in Austria, Belgium or France) has proved to be effective to resolve recurrent problems due to changes between design and execution. In some countries (for instance Latvia and Sweden), a temporary certification of the new and renovated buildings (Latvia) is issued. The certificate has a limited validity, and need to be replaced after the construction works are completed (usually within 2 years).

· Standard formats to document the input data and to report the results of energy calculations make the EPC input data and results documentation transparent (e.g. Estonia, France), and thereby ease compliance checks.

· Automatic checks in the calculation software and/or during upload into the EPC database as implemented in Austria or Belgium seem effective to contain non-compliance.

23. What do you think of the various ways of calculating building energy performance at national/regional level? Please include examples.

The ACE supports the response of the BPIE and emphasises that the methodology for the energy performance calculations of buildings must be harmonised with only the benchmarking scale being



adapted by local conditions.

A much stronger and dynamic link needs to be developed between actual energy consumption data and calculated forecasts, with the gathered stock data influencing the advancement of the calculation methods. A building physics approach can reflect a building's energy consumption 'potential' but how the final performance outcome is influenced by design and construction quality, as well as operating conditions is not well understood. Yet the impact of these factors can increase energy consumption several fold as well as compromise indoor environmental quality and usability. The calculation needs to include a methodology that helps built environment professionals account for these factors from early design stages. This methodology needs to be regularly updated as more operational data is available. The current status quo, where the calculation carried out for compliance does not reflect likely operating outcomes is untenable.

Harmonisation of data structures and mandating data disclosure of key building metrics and making gathered data available online is essential. The construction industry requires such data to spur competition and innovation and to educate built environment professionals, owners and end users about the effectiveness of different measures to improve building performance. The greatest challenge hampering progress is the lack of data in the public domain and multiple studies have shown that this can only be overcome by legislation. Mandating disclosure and benchmarking of key building performance indicators would result in significantly reduced regulatory burden as the means and methods of achieving improved performance could become national guidance rather than regulation. This approach would also open up the market for innovation in terms of products, services and systems.

BPIE

A lack of harmonisation in the calculation methodologies makes that assessment between the different approaches is problematic and that best practices cannot serve as guidance for other Member States. Only 19 of the 35 methodologies are in line with the CEN standards and even within some countries (i.e. Italy, Austria and Belgium), different approaches are observed.

Inappropriate basic principles can undermine compliance, in particular:

- Clarity in the rules to derive input data. This point is obviously fundamental to ease compliance checks. There is positive feedback from Belgium who has made specific efforts to clarify those rules to ease compliance checks.*

- Handling of innovation. Experience shows that, given the impact of energy performance regulations on the market, the penetration of innovative solutions is severely hindered if they cannot be fairly rewarded in these regulations. This can also lead to significant discrepancies between actual and calculated (according to the EPC procedure) energy performance. To overcome these problems, several countries (BE, NL, FR, DE) have developed frameworks for handling innovative products and systems (i.e., aspects that cannot or are poorly covered with the regulatory calculation method) or have open (yet approved) calculation methods allowing one to fairly consider technologies not explicitly covered by the regulation.*

24. What measures are missing that could simplify the implementation of building regulations to make sure that buildings meet the required high energy performance levels?

See response to Q23 and response by BPIE.

Mandating the disclosure of operational energy use alongside key contributing factors to building performance should be at the heart of the EPBD. In addition, the lessons learned from the data gathered in different sectors and regions should directly inform regulatory updates, continuous professional development and assessor accreditation.



BPIE

Member states should undertake measures on the following five levels:

· Innovation: the transition to high-energy performance levels runs along an experimental growth path. Innovation across the whole construction value chain is necessary so that different building elements are approached in an integrated method. An accelerated market introduction of new technologies and systems is desirable at three levels: 1/ research and development of new technologies and systems, concepts, processes, business models and supporting tools; 2/ the market uptake of this new technologies and systems (by strengthening the public and private demand side and more adequate market conditions) and 3/ consolidating the competitiveness of the European construction sector in an international context.

· Quality: consumers should be able to rely on the skills of the building professional and get value for money, which means state-of-the-art information and advice, achieving the expected (energy) performance, a maximum operational lifetime and a safe and healthy building. Quality schemes are necessary in case of: new technologies with insufficient knowledge, without quality scheme

insufficient knowledge acquisition, consciously poor execution or erroneous reporting, negative experiences with impact on the whole market uptake.

· Communication and dissemination: with the current technologies, high-energy performance levels are technically and economically feasible. Unfortunately, the lack of competences and knowledge both at demand and supply side leads to prejudice, wrong planning decisions and wrong execution. Instruments like databases with qualified professionals and example buildings, NZEB guidelines, individual renovation roadmaps etc. could be valuable.

· Financial: high energy performing buildings should be financial affordable. Although (mostly) cost-optimal over the total lifetime, the initial additional cost turns out to be an important barrier. Financial incentives and alternative financing methods should take into account the total cost over the lifetime and co-benefits and include those in mortgage affordability calculations. Furthermore, the financial sector should give advantages to 'future proof buildings', i.e. NZEB and active buildings.

· Policy level: clear target setting and effective implementation are needed, including monitoring and compliance measures for policies.

C. ENERGY PERFORMANCE CERTIFICATES (EPCS) AND STIMULATING ENERGYEFFICIENT RENOVATION OF THE BUILDING STOCK

25. Are the available data on the national/regional building stock sufficient to give a clear picture of the energy performance of the EU's building stock, as well as the market uptake of energy efficiency technologies and the improvement of the energy performance of buildings in the EU?

The availability of stock level data is ad-hoc, largely inaccessible to industry and incompatible even between data providers, let alone MS. ACE supports the position of BPIE with the caveat that EPC databases must be complemented by operational energy use data for all buildings with EPCs. Initiatives, such as the UK RIBA|CIBSE energy performance benchmarking platform Carbon Buzz have demonstrated that data disclosure has to be mandated for sufficient body of data to be available for statistical analysis. A system similar to the US Energy Star programme should be set up by the EU to reduce duplication of effort by MS and increase the data volume.



Harmonisation of performance metrics (not ratings) across Member States is essential to monitor how the Directive affects the upgrade of the private as well as public building stock across the EU. Calculated and achieved building performance metrics must become comparable while benchmarking the performance of buildings across national boundaries must also be possible. The alignment of data collection and reporting standards across the EU is a must to underpin progress in this area.

- ACE advocates the EU-wide harmonisation of reporting of high level data to improve transparency and to support the EU-wide monitoring of consumption of resources such as materials, water, energy, land for the built environment as well as for waste-generation and management. Alignment with ISO standards is recommended wherever possible.
- ACE recommends the mandating of reporting of quantitative indicators
- ACE advises that performance ratings and targets should be set at national level.
- ACE recommends a simple and transparent assessment framework with a graduated response structure (inviting more detail for more rewards), with an associated freely available online database to support EU-wide comparisons. An 'Open Data' policy must be mandated to achieve a step-change in improving building performance.

26. Are the long-term national renovation strategies adopted sufficient to stimulate the renovation of national building stock? What examples of best practice could be promoted across the EU and how?

The response to this question is a resounding no. The ACE emphatically supports the responses by BPIE, BAK and Coalition of Energy Savings. The revised framework for compliance must create the incentives for developers, landlords and occupiers to achieve a cost effective upgrade of existing stock while contributing to social inclusion and economic growth. At the minimum, the mandatory reporting of the actual energy consumption of projects before and after a retrofit has been recommended for all building types to guarantee the availability of data for future targets and benchmarks to be set based on statistical evidence.

In addition the ACE strongly advocates the creation of better incentives for more holistic retrofit solutions by interlinking financial instruments for energy efficiency with architectural renovation to significantly increase the uptake of energy efficiency measures.

In recent years the financing of energy efficiency measures, in particular the retrofit of the existing stock has been decoupled from investment in the spatial and architectural design of buildings. With legislation focusing on technical solutions to energy efficiency, the business case to undertake spatial and architectural renovation as part of an energy efficient retrofits and vice versa has been undermined. As EU Member States embark on one of the largest ever retrofit efforts ever undertaken, there is a major opportunity to improve the uptake of efficiency measures by interlinking the financial instruments with architectural design and renovation. By re-connecting energy efficiency with market drivers for architectural renovation, the public investment in energy efficiency will offer far greater returns and achieve greater traction and robustness for technical solutions.

ACE calls for the development of innovative financial schemes for energy and resource efficient buildings that regard architecture as part of the solution rather than an on-cost.



27. Have EPCs played a role in increasing the rate of renovation, the extent of renovation, or both? For instance, are EPC recommendations being defined as the most effective packages of measures to move the performance of buildings and/or their envelopes to higher energy classes?

The ACE emphatically supports the responses by BPIE and the Coalition of Energy Savings. Feedback from ACE member organisations points to the fact that in practice EPCs feature very low on the priority list of building characteristics to consider by home buyers and even tenants, if on the priority list at all.

In terms of the information provided in the EPCs to help owners implement improvements, in the UK, the information is minimal and has in certain cases been found to be inaccurate. Buyers are not viewing the EPC as a set of recommendations for home improvements and would seek alternative sources of information before undertaking work to their homes.

EPCs for rented accommodation will possibly drive some landlords to upgrade their rental buildings in view of the 2018 requirements for rental accommodation to achieve a minimum of EPC rating E. Whether this regulation will have this impact remains to be seen and it should be noted that EPC rating E is very poor in relation to what would be needed to address the required carbon emission reduction targets and relatively easily achieved.

The main feature of EPCs are that they communicate energy performance to the consumers and therefore establish an explicit and measurable sales criteria which otherwise would not have been considered. Work needs to be done on EPCs however, as the theoretical values do not necessarily reflect actual energy use. Preliminary data from the Danish energy Agency shows a tendency that low graded buildings actually have lower energy use than predicted (indicating a positive effect of building occupants' behaviour) while buildings graded as efficient have higher energy use than predicted (indicating that occupants' behaviour result in lower savings but higher comfort standards). The net influence of the EPCs seems thus to be quite reduced.

Coalition

The EPBD, while primarily focusing on new build, should also be a key enabler for the transformation of the existing building stock towards a NZEB level building stock by 2050, provided it is well coordinated with the EED. In this regard, EPCs play a key role by informing tenants, owners and potential investors on how to improve the energy performance of buildings and by triggering financial investments needed for measures such as (staged-) deep renovation, improving operation and maintenance, etc. However, to be really successful, EPCs require implementation, convergence and compliance. Therefore, to speed up renovation rates, EPCs must be reinforced and their quality ensured, so as to become a real trigger for the renovation of our building stock.

BPIE

No. Today, all EU Member States have implemented a national EPC scheme, although different approaches with regard to the comprehensiveness and quality assurance for EPCs provide a very diverse picture of implementation. The intended positive impact on the market for energy efficiency improvements is only documented for a small number of Member States in which an effect on the property value related to its EPC rating can be detected. The required recommendations for measures improving the energy performance are mostly scarce or non-existing in most national EPC versions. Therefore, it can be suspected that the current stimulating effect of EPCs for renovations of buildings is limited. Aspects related to efficiency improvement measures such as thermal comfort and indoor air quality are essentially not covered by the current EPC format.



Given the lack of practical guidance for building owners and the missing trust in the reliability of the EPC data, the instrument is today rather seen as an administrative burden by building owners. A lack of standardized quality assurance processes in issuing EPCs adds further complication and disregard by the market.

In conclusion, the current sub-optimal requirements and implementation failures discredit the EPC scheme as such, though it could be a prime instrument to provide transparent and credible consumer and investor information, and stimulate the transformation of the European building stock.

28. Is setting a minimum renovation target for Member States to undertake (e.g. each year; percentage of building stock) important and requires further attention in the context of meeting the goals of the EPBD?

Yes it is and the ACE supports the position of the BPIE and BAK and agrees that such targets should be further increased, with the caveat that these should be realistically prepared and accompanied by other measures (financial, regulatory) to enable their achievement.

BPIE

Yes, minimum renovation targets are important and essential to ensure that the goals of the EPBD are met. In the long term, the entire EU building stock should become sustainable in order for the EU to meet the 2050 emissions reduction targets. The targets should account for energy saved from renovations as a percentage compared to an internationally fitting accounting historical year (1990, 2005 or other).

Renovation targets should be defined clearly and directly address unintended applications of the provisions regarding major renovation. The article 5 of the Energy Efficiency Directive establish a mandatory target of annual renovation for heated and/or cooled building owned and occupied by central government but, unfortunately, it results in low ambitious implementations by the MS.

In addition to renovation targets, there is the need for accurate definitions on the rate and depth of renovation. A distinction needs to be made between general renovation for aesthetic purposes and energy related renovations, since the first does not necessarily contribute towards the aims of the EPBD and has the potential to distort the reality of reported progress.

Alongside a minimum renovation target, the EU should be aiming for deep renovation, whose definition needs to be based on a reduction of energy demand by at least 70% and an ambitious EPC rating.

BAK

Basically the naming of objectives is positive, since they give an idea of what efforts are needed. The definition of objectives and the choice of instruments to achieve this should be left to individual countries.

29. Are obligations or binding targets for renovation or any other mandatory measure (e.g. mandatory minimum thermal efficiency standards for rental properties) missing from the EPBD to ensure that the directive meets its goals? If, yes, what kind of obligations and targets?

Yes, the ACE supports the responses by BPIE, noting however that 'building owners need to be incentivised to energy retrofit by being informed and being financially supported'.

It is also essential that the calculation methods for predicting the performance benefits of a retrofit



are revised so that they do not inadvertently create excessive cooling loads and maintenance obligations. A typical unintended consequence of the current EPBD (and commercial pressures) is the installation of complex services for the supply of fresh tempered air into previously naturally ventilated buildings. This is frequently accompanied by the compromising of thermal mass and tall floor to floor heights alongside the replacement of large operable area windows with restricted ones, creating buildings that are more energy intensive rather than less and more fragile in terms of their requirement of high technicity for their operation and routine maintenance. They are often less comfortable due to the lowered floor to ceiling heights and lost connection to the outdoor environment.

BPIE

Yes, they are missing. As noted earlier, this area should be the priority objective for the EPBD review. There are a number of options for targets/obligations:

- The rental, letting, or sale of a property in the lowest quartile energy performance (or similar benchmark) should be banned from 2020*
- The 3% public sector renovation target should be made mandatory – no alternative measures permitted*
- There should be targets for improving all social housing to at least the level of the average stock within say 10 years.*
- The “major renovation” threshold should be reduced to 10% and apply to all buildings*
- There should be a requirement to improve the energy performance of any building component or technical system whenever that element is in need of replacement*

A number of MS, regions or cities have introduced various obligations requiring improvement in a building’s insulation level and/or heating systems, subject to certain trigger points. For example,

- Within a specific timeframe (DE; FR)*
- When undertaking maintenance work on the building – (FR)*
- When renting a property –(UK; Flanders Region of BE)*
- At change of use of building – (DK)*
- When changing a boiler – (Baden-Württemberg, DE; Bolzano, IT)*
- In case of an extension to the building surface – (A number of regions and cities in IT)*
- When undertaking major building improvement (EU-wide – EPBD Art. 7)*
- For the central Govt Estate (EU-wide EED Art. 5)*

The experience from these examples shows there is much more that could, indeed should be done to require building performance improvement under certain conditions, or for certain categories of buildings, since relying on purely voluntary approaches means that the existing building stock will continue to suffer from an insufficient rate of sub-optimal renovation.

30. Are EPCs designed in a way that makes it easy to compare and harmonise them across EU Member States?

No, the ACE supports the response of the BPIE. Harmonisation of performance metrics across Member States is essential to monitor how the Directive affects the upgrade of the private as well as public building stock across the EU. Calculated and achieved building performance metrics must become comparable while benchmarking the performance of buildings across national boundaries must also be possible. Harmonisation of performance metrics (not ratings) across nation states is paramount to monitor how the directive affects the upgrading of the private as well as public



building stock across the EU. The new framework of compliance must create the incentives for developers, landlords and occupiers to achieve a cost effective upgrade of existing stock while contributing to social inclusion and economic growth. At the minimum, the mandatory reporting of the environmental impact of works carried out has been recommended for all building types to guarantee the availability of data for future targets to be set based on statistical evidence and benchmarking. Once adequate data is available EU-wide binding targets should be set for public buildings initially, to achieve progress.

The alignment of data collection and reporting standards across the EU is a must to underpin progress in this area. A simple and transparent assessment framework with a graduated response structure (inviting more detail for more rewards), with an associated freely available online database to support EU-wide comparisons is seen as the most beneficial intervention. Mandating reporting of quantitative indicators rather than a rating system is advised at least initially. All products entering the EU should be required to undergo the same assessment to ensure a level playing field when evaluating products and outcomes.

ACE advocates the EU-wide harmonisation of reporting to improve transparency and reduce the cost and specialist training required for reporting. Alignment with ISO standards is recommended wherever possible. ACE recommends the mandating of reporting based on harmonised standards but advises that performance ratings and targets should be set at national level.

ACE agrees that robust benchmarks need to be based on gathered evidence of achieved performance in use. Benchmarking should be mandated to be effective but binding targets on achieved performance should be agreed at national level. An 'Open Data' policy must be mandated for any such frameworks to succeed.

ACE recommends the harmonisation of high level data across national boundaries to support the EU-wide monitoring of consumption of resources such as materials, water, energy, land for the built environment as well as for waste-generation and management.

BPIE

Lack of comparability has to do, to a large extent, with the differences in the quality of the EPC between countries (sometimes within one country only). Further improvement of the quality control mechanism, harmonisation of the requirements for the qualified experts, enforcement of the penalties for non-compliance, should improve the status quo.

Other important factors are the differences in the calculation methodology, in particular related to use of primary and finale energy factors and including in the calculation different energy uses. Choice and design of the assessment methodology is one of the major challenges of the EPC implementation on the national level. It needs to take into account the differences between building types (new and existing, residential, commercial and public, large and small etc.) and the specific circumstances (function, occupancy levels), at the same time securing the comparability of the energy performance levels.

The European Commission should provide the further guidance for further harmonisation of the calculation methodology across Member States; the links between EPBD and CEN standardisation should be further strengthen.



31. Do you think that the 'staged deep renovation' concept is clear enough in the EPBD?

No. The ACE strongly supports the response of the BPIE to this question.

BPIE

No. EPCs could evolve into a meaningful tool to increase the rate and depth of building renovations, this by foreseeing an individual staged renovation roadmap, customised to the building and its owner/occupant. This instrument would help avoiding lock-in effect.

Besides the individual renovation roadmap, additional relevant information could be gathered such as maintenance and reparations, energy consumption, thermal comfort and indoor air quality aspects, involved (qualified) building professionals... Questions could be raised as well on the best available medium to document this. Given the current and future ICT- prospects, this 'building passport' should be digitalised, which would facilitate the further development of (open source) centralised databases.

32. Have EPCs raised awareness among building owners and tenants of cost-efficient ways of improving the energy performance of the buildings and, as a consequence, help to increase renovation rates across the EU?

The ACE supports the response of the BPIE with the caveat that EPCs need to be more closely linked to actual, NOT theoretical building performance. EE retrofits should prioritise architectural solutions to reducing energy use, such as building form and mass, usability, spatial adaptability and other parameters. These should be recognised as preferential over solutions that may appear more effective and lower cost in the short term such as mechanised/automated heating, cooling, ventilation, lighting solutions.

Long term maintenance and resilience risks bring an additional challenge to the economic viability of energy efficient building retrofits. With the uncertainty associated with the capital and whole life cost of technological interventions, owners and occupiers have showed a low willingness to invest in the energy efficient upgrade of their buildings. ACE members have reported increasing social tensions resulting from rising rental costs due to the higher investment required for low-energy refurbishments. Tighter legislation that does not address such concerns will continue to be viewed as a barrier for investment by building owners and operators. The mandatory disclosure of operational energy use alongside asset ratings is viewed as a fundamental step for achieving real energy savings in building operation. Extensive feedback from public and commercial developers, landlords and owner occupiers indicates that creating a 'level playing field' in this way is the most effective way to engage stakeholders with the economic benefits of EE. Such a measure would also ensure that energy efficiency measures consider downstream operational and maintenance risks, resulting in more holistic interventions and resilient buildings. Therefore new legislation must ensure that operational energy use can be more effectively targeted. Design stage predictions must be possible to compare to operational performance and enable more robust verification of actual energy use and comfort levels achieved. Any new construction or retrofit that is linked to an improvement of EE puts financial pressure on owners and tenants. This pressure should be kept at the least possible minimum and should not exceed capacities of these groups as in some cases and member states it already leads to social exclusion and indebtedness. It needs to be kept in mind that the cost of reaching the targets in energy savings and EE in the building sector cannot be carried by the private economy alone.

The alignment of data collection and reporting standards across the EU is a must to underpin progress in this area. A simple and transparent assessment framework with a graduated response



structure (inviting more detail for more rewards), with an associated freely available online database to support EU-wide comparisons is seen as the most beneficial intervention. Mandating reporting of quantitative indicators rather than a rating system is advised at least initially.

BPIE

To a limited extent. EPCs are still often regarded as an additional administrative burden for the building owners, rather than a useful instrument that support improvement of the energy performance and/or accurately estimate a building's characteristics.

Improving the reliability and understanding among building owners the benefits of having a better energy rating, will influence the perceived usefulness of EPCs. EPCs need to become the starting point of individual improvement plans for each building, providing detailed, tailor-made recommendations and other useful information. European Commission should therefore propose an inclusion of new mandatory indications in the scope of EPC, such as indoor air quality and comfort issues.

EPCs have the potential to become "building passports" accompanying a building through its life cycle and include improvement proposals and energy renovation activities (in a step-by-step approach). Indeed, in order to become useful in individual buildings' improvement plans, EPCs should evolve towards more comprehensive, dynamic tools accompanying a building over its lifetime.

33. Should EPCs have been made mandatory for all buildings (a roofed construction having walls, for which energy is used to condition the indoor climate), independent of whether they are rented out or sold or not?

Yes

D. FINANCING ENERGY EFFICIENCY AND RENEWABLE ENERGY IN BUILDINGS AND CREATION OF MARKETS

34. What are the main reasons for the insufficient take-up of the financing available for energy efficiency in buildings?

The ACE supports the responses by BPIE and Coalition for Energy Savings. Feedback from member organisations supports these responses. For example:

In the case of Spain several circumstances. In the case of housing, people who have the greatest need to improve the energy efficiency of their homes do not have the financial resources to address these changes and not receive credit for it. Public funding programs through the Autonomous Communities have not yet been launched and is therefore difficult to assess its impact. Financial institutions do not have available products to suit regulatory circumstances in Spain and is the law of condominiums.

For other uses, funding for improving the energy efficiency of buildings is more accessible while the economic returns are more easily measurable, such as offices.

In the UK the Green Deal was financially unattractive as the interest rates were higher than the typical mortgage rates. There was therefore no advantage to taking on the Green Deal loan, especially as the Green Deal would also restrict the type of work that could be covered by the finance. This was a case of an incentive misjudged in terms of financial attractiveness, but was



also bureaucratic and time consuming to secure.

Other incentives have been successful. The FITs for PVs has had a good uptake and indeed the reduction in FITs payments has been severely criticised in terms of setting back the industry when (and perhaps before) it had reached a healthy independence from subsidies.

Any proposed updates to the directive must address the following:

- Split incentives between landlords and tenants lead to underinvestment
- Tenants are doubly penalized:
 - they have high energy expenditures due to energy-inefficient building characteristics,
 - and because they are poorer than homeowners, they are unable to invest in energy-saving systems.

In terms of public policy, the government should focus on low-income tenants, and mandatory measures such as minimum standards seem appropriate. Financial support from a third-party financier also might be a solution.

Coalition for Energy Savings

There are some good financing tools available, which need to be further developed. Examples include: tax exemptions and rebates, Energy Performance Contracting, on-bill financing, reduced VAT rates for construction services, promotion of energy efficiency goods, linking specific financial tools (e.g. lower interest rates) to the (renovation into) nZEB level.

However, there are also still too many barriers causing an insufficient take-up of available financing for energy efficiency in buildings, such as:

- inappropriate Eurostat rules on public debt and deficit for energy efficiency investments;
- a lack of aggregators to increase the size of projects; and
- a lack of aggregated data and regulatory stability to boost the investors' confidence.
- the "split incentive" dilemma between landlord and tenant

BPIE

Financing has not been geared to the specific requirements and economic circumstances of different building owners.

The level of interest rate can be a barrier to take-up of energy efficiency investments.

There is a lack of technical and project development assistance facilities that build capacity among the parties required to undertake energy efficiency renovations (developer, installers, SMEs energy auditors, etc)

Energy efficiency is not yet been mainstreamed in mortgage affordability calculations.

The profile of energy efficiency investments has not been raised among sectors of the economy with capacity to invest and drive the market, such as large companies. Since these first movers are not taking actions to increase demand for energy efficiency measures, other actors will not follow despite the availability of financing.

Effective mechanisms to address split incentives have not been set in place.

35. What non-financing barriers are there that hinder investments, and how can they be overcome?

The ACE supports the responses by Coalition for Energy Savings and BPIE. In addition, the ACE would like to highlight the lack of expertise amongst property agents as a major barrier that hinders investment.



As part of the [INSPIRe project](#), in which the ACE is a consortium partner, non-technical barriers of various stakeholders, such as architects, public and private property owners were investigated. Preliminary results on this issues showed an extensive list of barriers hindering the market up-take of energy efficiency building retrofitting, such as cost incentives and payback time.

Feedback from ACE members indicate that the non-financial barriers still include lack of knowledge on the part of the public and professionals. The architectural education (as well as surveying, engineering, building contracting, conveyancing etc.) has to include in the curriculum specific (as opposed to generic) references to sustainable design and low carbon buildings including solutions. Also more information is required for the public as they are the potential clients who can demand energy efficiency.

Another major non-financial barrier is the disruption to the building occupants. Approaches and methods of upgrading buildings that are less disruptive have to be made more available.

The ACE argues that overwhelming evidence needs to point to links between energy efficiency, indoor comfort and occupant well-being in order for improved building performance to begin to be linked to building value. Significantly more data and data analysis and a transformation of the regulations to report against operational performance will be required to achieve this. Without these measures, excessive financial subsidies will be required to achieve EU targets for energy efficiency. The current regulations are not suitable to substantiate any such relationship.

Coalition for Energy Savings

There is a need to better understand what is a 'Smart Building'. This work should at least address the following issues:

- *Well-designed building*
- *Able to adapt to its occupants spatial and functional needs,*
- *Priorities the architectural determinants of comfort and productivity over highly technical solutions*
- *Resilient to transient occupancy patterns and variable intensity of use*
- *Requiring minimal building management*
- *Capable of supporting the monitoring and maintenance of systems through an easy-to-use technical interface*
- *Achieving occupant comfort and productivity with the least amount of energy used comes first*
- *Right materials and equipment specified and installed*
- *Connected through the smart grid to its neighbourhood*
- *Functional, comfortable and healthy indoor environment*
- *Intrinsic low energy demand*
- *Cost-effective use of renewable energy sources*

Being fully integrated into the wider energy system a 'Smart Building' can, through demand response and energy storage, ensure increased flexibility and deliver better value to owners and occupants. A Smart Building empowers its owner or occupant to take informed decisions about energy use throughout the lifetime of the building through the provision of reliable, protected, real-time data on the building energy production and consumption.

BPIE

Lack of advice of cost-effective energy saving opportunities is an issue exacerbated in this period of rapidly advancing technological development, where it can be difficult even for professionals to



keep abreast of prevailing best practice. Dissemination techniques need to keep pace with the evolution of consumer needs and media. The market place is complex, and energy efficiency investments have to compete effectively. Due to miscommunication issues, in some cases consumers are not aware of or do not fully comprehend the effectiveness of specific technologies. This may lead to scepticism over implementing a technology especially if two or more professionals give supposedly conflicting advice as to the best way to renovate. This can be overcome through demonstrations and information campaigns.

Awareness of energy savings potential is low. While there is a general appreciation that energy saving is a "good thing", there remains a lack of understanding of the energy, cost and carbon savings from different measures.

Skills and knowledge of building professionals is not optimal across the EU. Skill shortages exist in both the contractor market responsible for effective installation of energy saving measures, as well as in professional services, with few architects and designers familiar with how to specify a low energy renovation.

Regulatory and planning barriers range from various degrees and speeds at which EU Directives, including the EPBD, have been implemented by autonomous regions within a Member State, through to energy market barriers, such as the approvals process for building integrated renewable technologies

Multi-stakeholder barriers exist where there are multiple owners and/or occupiers of buildings. Ownership and responsibility can be opaque, while it can be very difficult to agree on energy saving investments in multi-family residential buildings if many different property owners have to either approve a decision or make a financial contribution.

36. What are the best financing tools the EU could offer to help citizens and Member States facilitate deep renovations?

In recent years the financing of energy efficiency measures, in particular the retrofit of the existing stock has been decoupled from investment in the spatial and architectural design of buildings. As EU member states embark on one of the largest ever retrofit efforts ever undertaken, there is a major opportunity to improve the uptake of efficiency measures by interlinking the financial instruments for energy efficiency measures with architectural design and renovation. By re-connecting energy efficiency with market drivers for architectural renovation, the public investment in energy efficiency will offer far greater returns and achieve greater traction and robustness for technical solutions. ACE supports the development of innovative financial schemes for EE in buildings that appreciate architecture as part of the solution rather than an on-cost. Zero percent loans should be considered for all renovations that achieve outstanding energy efficiency targets in operation lasting a certain number of years.

37. What role do current national subsidies for fossil fuels have in supporting energy efficient buildings?

The ACE supports the response of the BPIE.

BPIE

Fossil fuel subsidies (FFS) in the form of heating bill support-payments are used by governments as the main instrument to support vulnerable consumers. The social aspect of the payments disguises the fact that the subsidies encourage and prolong the use of fossil fuels. Besides having an adverse impact on the climate, the payments are an ineffective solution for supporting



vulnerable households, as they require continuous and increasing funding without generating economic growth and result in wasteful energy consumption. It is striking that in Ireland the budget allocated to the National Fuel Scheme increased by 170% to €228 million from 2004 to 2010 and in Greece, €650 million were committed to oil subsidies for heating from 2010 to 2014 but only €548 million to energy improvements in houses. Therefore, fossil fuel subsidies play a negative role on energy efficiency in buildings by supporting wasteful energy consumption and by spending every year big part of the public budget, which could have been allocated for energy efficiency measures. Thus, it is high time that policies and financing shifted from supporting inefficient and climate-damaging FFS to promoting energy efficiency measures, leading Europe to smart, sustainable and inclusive growth.

39. How is investment in high-performing buildings stimulated and what is being undertaken to gradually phase out the worst performing buildings? Is it sufficient?

The ACE strongly supports the response of the BPIE and adds that it is critical that the definition of best and worst performing buildings cannot be based on EPCs, which do not necessarily reflect actual energy performance accurately.

The fact that current legislation does not mandate the reporting of achieved operational performance or the validation of the indoor spatial and environmental quality achieved results in a significant gap between the expected and achieved energy performance of buildings. The lack of a transparent relationship between EPC ratings and actual performance outcomes can compromise the long-term resilience of a building. The ACE calls for a more transparent and harmonised reporting and benchmarking of building energy use; for the disclosure of building operating performance across all sectors; for the implementation of measurement and verification of energy performance in use; for EPCs to meet market needs and have a transparent relationship to actual energy use; for transparent reporting by MS on building level performance indicators.

Harmonisation of data structures and mandating data disclosure of key building metrics and making gathered data available online is essential. The construction industry can use such data to spur competition and educate built environment professionals, owners and end users about building performance. The greatest challenge is the lack of data in the public domain.

BPIE

In Europe, there are good examples of schemes for financing building renovation, in terms of scale, financing, addressing non-technical barriers, level of ambition or achievement of social objectives. They include schemes such as zero energy retrofits of social housing at zero cost for tenants (e.g. “Stroomversnelling” programme in Netherlands), revolving loan funds (e.g. KredEx in Estonia), large scale national programmes incentivising deeper renovation (e.g. KfW in Germany), renovation programmes addressing specifically fuel poverty (e.g. Habiter Mieux en France) and energy performance contracting for the public sector (e.g. the Carbon and Energy Fund in United Kingdom).

Mandatory renovations are also established in some countries following six “trigger points”: within specific timeframe (e.g. EnEv 2014 in Germany and energy transition law 2015 in France), when undertaking maintenance work on the building (e.g. Energy transition law 2015 in France), when renting a property (e.g. in United Kingdom and Flanders Region of Belgium), at change of use of building (e.g. in Denmark), when changing a boiler (e.g. in the German region of Baden-Württemberg and in the province of Bolzano) and in case of an extension to the building surface (i.e. in some Italian regions and cities).



Unfortunately, all these examples are isolated cases and a comprehensive strategy at European level is missing.

40. What is being undertaken to solve the problem of 'split incentives' (between the owner and the tenant) that hampers deep renovations? Is it sufficient?

The ACE supports the response of the BPIE. This area needs significant attention. EPCs are not creating sufficient interest and awareness to make more efficient properties more attractive. As such there is no monetary incentive for landlords to upgrade their properties. A potential way to highlight the running costs of a property and consequently the level of energy efficiency would be to legally require landlords to advertise their properties including monthly rent and utility costs (average over the past years). While it is well understood that energy consumption depends on the users, by requiring data from several years of use would provide a reasonable estimate of consumption. This would allow tenants to make an informed choice and take into account running costs.

BPIE

The split incentive is probably the most long-lasting barrier, particularly due to the complex structure of occupancy both in terms of the residential and non-residential sector. It is identified by the BPIE survey of 2011 as having a particular impact on existing buildings. This barrier is sometimes considered a financial barrier and, understandably, there are financial implications. It is as well considered as an institutional barrier. No single policy instrument can address split incentives and to this extent the IEA states that “neither regulatory mechanisms, (e.g. minimum energy performance standards, or regulated contract design), nor information-based instruments (i.e. awareness campaigns) alone will resolve them. Instead, governments should help design well-targeted policy packages to address PA problems in their specific national contexts, and within the particular constraints of a given sector. These packages should include measures to: a) address contract design to ensure end-users face energy prices, b) regulate the level of energy efficiency in appliances and buildings, c) improve access to information about energy efficiency performance.”

E. ENERGY POVERTY AND AFFORDABILITY OF HOUSING

42. What measures have been taken in the housing sector to address energy poverty?

The ACE supports the response of the BPIE.

BPIE

Energy poverty (or better fuel poverty) is being alleviated - or not - on member state or even regional level. Unfortunately, these measures focus mainly on providing fuel subsidies covering the heating cost and on income support schemes. It is observed that in several EU countries the (social) housing sector “takes advantage” of energy efficiency schemes to implement energy efficiency measures in fuel poor households. The programs “habiter mieux” (France), the “warmer homes scheme” (Ireland), the “warm front scheme” (England), the ERDF thermal renovation of block of flats for low income families in Romania, are some examples of the efforts that have been made to support energy efficiency measures in fuel poor households. However, in most cases such



programs are mostly not integrated in a strategy on national (or European) level with the objective to eradicate fuel poverty. The existing fuel poverty schemes are often valuable, but should be integrated in a broader national strategy.

For example, in the UK the Energy Company Obligation 2 is a financial instrument implemented through the energy companies and is aimed at supporting vulnerable and low income people with funding insulation measures in their homes. On the other hand, Spain has not yet taken any concrete measures to combat energy poverty.

The modification of the Technical Building Code: Royal Decree 214/2006 (updated by Order FOM / 1635/2013), Regulation of Thermal Installations: Royal Decree 1027/2007 (updated by RD 238/2013) and the implementation of energy certificates by Royal Decree 235/2013 for Building energy Certification contribute to improving the efficiency of existing housing but not specifically to improve the situation of energy poor way.

Aid program for energy rehabilitation of existing buildings (PAREER CRECE) derived from Directive 2012/27 / EU also contribute to improve the housing stock by increasing the grant in some cases by "social criteria", but it is specific to energy poor.

43. Should have further measures tackling energy poverty been included in the EPBD?

The ACE supports the position of the BPIE on this.

BPIE

Yes, in the current EPBD there is only a general statement that "Member States should draw up lists of existing and proposed measures that [...] potentially contribute to reducing energy poverty". As energy poverty is inextricably linked to buildings' energy efficiency, it is vital for its alleviation that the problem is clearly stated in the EPBD and certain actions are proposed.

The climatic differences of the countries and the average national income rates should be considered carefully as far as the regulatory approaches are concerned. SECTION E – ENERGY POVERTY AND AFFORDABILITY OF HOUSING should elicit attention to the reality of the predominant percentage of energy poverty households per capita in the different MSs. As subsidising the consumption of fossil fuel should be obviously abandoned, the segment of the population utilizing such, which in some of the countries is considerable, should be offered attainable affordable options.

44. Has tackling energy poverty been a requirements when constructing new buildings and renovating existing buildings in Member States?

The ACE agrees with the BPIE's response.

BPIE

In general no. Currently, requirements for new constructions and renovations are referring to energy and environmental related aspects, without taking into consideration social aspects, such as energy poverty. However, there are some exceptions such as in France, where the French Energy Transition Law states that 50% of future building retrofits should focus on low-income households in order to reduce energy poverty by 15% until 2020; and in England, where in the Fuel Poverty Strategy it is stated the fuel poverty target is to ensure that as many fuel poor homes as is reasonably practicable achieve a minimum energy efficiency rating of Band C, by 2030.



For example in Spain, while it is true that the rehabilitation must now meet minimum energy efficiency standards no minimum habitability conditions (having no risk to the health of its occupants) are guaranteed.

Besides this, as it is not possible to characterize households in situation of fuel poverty, it is not possible to understand their needs and define the most appropriate rehabilitation measures to alleviate their condition.

45. Are energy costs for heating and air conditioning being made available to interested buyers/tenants?

The ACE agrees with the BPIE's response.

BPIE

In general, property owners are not obliged to provide the future tenants/buyers information about the energy cost. However, in some cases energy costs are part of the Energy Performance Certificate, which should be attached to rental/buy agreement.

For example in Spain the transposition of European directives 2009/72 / EC and 2009/73 / EC concerning common rules for the internal market in electricity and gas has resulted in Spain respectively in Law 24/2013, of December 26, the Electricity Sector (government of Spain 2013) and only ensures a discount on the electricity bill and in some groups of households.

First has not been proven that those households that can benefit from a reduction in electricity bills are energy poor and secondly Spain home heating are powered by gas, diesel and coal and any discount apply on these fuels bills. Discount only on the electricity bill.

F. ENSURING NEW HIGHLY EFFICIENT BUILDINGS USING A HIGHER SHARE OF RENEWABLE ENERGY

46. What are the best policies at district and city level to increase energy efficiency in buildings? Have specific targets on renewable energies in buildings been included?

In dense cities zoning regulations should have increased focus on daylight and solar access, since these are the key design factors affecting building energy use, quality of life, health and wellbeing, particularly in Northern Europe (Sattrup & Strømman-Andersen 2012). Densities should be balanced, and urban sprawl avoided. Higher densities of urban perimeters should be pursued rather than urban expansion. Smart city strategies and technology should be developed and implemented, focussing on resource management - particularly strategies and technologies which empower citizens to make informed consumption choices, be it in regard to building energy use, transport, food or other consumption matters. Urban metabolism is the key word. We need better and more precise open source information on resource flows, to enable decision making for both citizens, policymakers and businesses.



Saying that, the design of 'smart buildings' cannot be seen as the universal solution to decrease the carbon foot print of the built environment. Generally more fragile, smart buildings require high technicity for their operation and routine maintenance. A greater emphasis is needed on the evaluation of buildings over their lifecycle so that more architectural solutions to energy use, such as building form and mass, usability, spatial adaptability and other parameters are recognised as preferential over solutions that may appear more effective and lower cost in the short term such as mechanised/automated heating, cooling, ventilation, lighting solutions.

47. On the basis of existing experience, are provisions on targets or specific requirements for new buildings, beyond the current NZEB targets, missing in the EPBD which could help achieve the energy efficiency 2030 target? If so, in what types of targets or requirements?

The ACE agrees with the position of the BPIE with the caveat that to achieve this, the construction industry, in particular the design, installation and commissioning of building control systems would have to undergo a major revolution. We also need full implementation of LCA and LCC methodologies in public and private procurement. The impacts shown in LCAs (carbon footprint etc) should be connected to the price structure through eg carbon costing.

BPIE

Yes, future buildings (2030) should be energy efficient, smart (automated monitoring and control of the operational performance), interact with the energy market (produce and store renewable energy and demand responsive - see Q52), comfortable and healthy. These provisions are not or limited foreseen in the current EPBD.

48. Which building sectors have been addressed as a priority (public/private, residential/non-residential, industry, heating & cooling)?

New education buildings, public or semi-public (such as the premises of not-for-profit organisations) offices and affordable housing.

49. Has having no EU set targets (indicative or binding) for the sustainable public procurement of NZEB buildings by public authorities affected the development of NZEBs?

The ACE agrees with the BPIE response.

BPIE

Yes, in a negative way. In general, public authorities are having a 'wait and see attitude'.

50. Has the EPBD framework improved the self-consumption of electricity in buildings?

The ACE supports the BPIE response:

BPIE

The EPBD has to a certain extent stimulated the deployment of on-site renewable energy technologies. However, not in all Member States the instantaneous storage or use of the produced green energy is allowed or encouraged. As a result, the produced energy is injected in the public



network instead of being used locally. Smarter regulatory frameworks are needed in order to maximise the share of energy being stored or used immediately and locally, especially during peak times. This would generate several benefits, such as balancing the grid and lower energy costs. It is also important to clarify and limit the scope of the word “nearby” renewable energy production, so that behavioural measures – such as the subscription of a contract with a green energy supplier or the financing of a local renewable energy project – are not perceived on the same level as structural measures.

51. Does the EPBD address the issue of embedded energy? If so, in what way?

No, and this is a major flaw

52. Is demand response being stimulated at the individual building level and if so, how?

The European demand response industry is still rather limited, both in terms of MWh and diffusion of energy aggregator business activities. Demand response aggregators have consisted predominantly of a few national players with strong positions in their home markets. In 2014, EnerNOC's acquisition of Entelios and Activation Energy, and Alpiq buying Flexitricity may signify a shift in the dynamics of this relatively small and yet expanding market. Load reduction from demand response accounts for a minimal part of existing non-balancing mechanism schemes. For instance, in the UK only 5% of the Demand side Short Term Operating Reserve comes from load reduction.

The causes for under stimulated demand response at the individual building are threefold. Firstly, in European electricity markets there is no significant afternoon peak load. This is contrary to what happens in the U.S., where the presence of high peak and highly flexible loads from air conditioning enhances the case for demand response, at least during the summer period. Secondly, there is limited evidence regarding the energy conservation impacts of demand response. This is to say that uncertainty on the net energy demand reduction and carbon emission reductions associated with demand response are preventing policy-makers from issuing policies which are strongly in favour of demand response. Thirdly, and as a consequence of the previous two points, the energy demand aggregator industry puts forward the argument that current regulatory frameworks in Europe are holding demand response back.

53. What obligations are missing at EU level and national level, and at regional and local level to meet the goals of the EPBD?

In the first instance the requirement to report and disclose the actual energy consumption data of all EPC obliged buildings and that data should be collected in a centralised and accessible EU database that would make it available for free for analysis and commercial use. This would empower a paradigm shift in both the energy distribution market and the energy efficient construction sector.



G. LINKS BETWEEN THE EPBD AND DISTRICT AND CITY LEVELS, SMART CITIES, AND HEATING AND COOLING NETWORKS

54. What are the best policies at district and city level for increasing energy efficiency and use of renewable energy in buildings?

To foster a holistic view on energy efficiency and sustainability the emphasis should be put not only on buildings but also on city, town quarters and urban and rural communities. Furthermore it is not enough to focus on singular assets such as buildings. The legislation needs to create an incentive for neighbourhoods, districts and cities to engage with large scale efficiency measures. Whilst building scale interventions are central to achieving energy saving targets, these must be considered within a strategic legislative framework for more efficient energy supply, transportation, industrial and agricultural production. A sustainable future can only be achieved with combined efforts in urban and rural areas. Communication rather than prescription of best practice should be a priority. Challenging as it may be, sharing of actual consumption data of buildings in the public domain is essential to enable this transformation.

55. Are there any separate (new) obligations set at city and district level missing from the EPBD which would help increase energy efficiency and use of renewable energy in buildings?

Compiling city level datasets of building energy use and make available to industry for the provision of new products and services.

57. Are smart meters and their functionalities contributing to meeting energy efficiency targets and the proper implementation of the EPBD? Are other targeted meters for heat, gas and water have specific provisions such as those for electric meters needed?

The short answer is no but the situation on the ground is more complex. The ACE supports the response of the BPIE with the caveat that the feedback from building performance evaluations carried out in the UK between 2010-2015 has seen fundamental shortcomings in the design installation, calibration as well as the ability to monitor meters and submeters. Although the regulations are mandating that 90% of end uses should be monitored, the status quo is that even when meters are correctly specified and installed, building management systems are not geared up to log readings and in any case, there is little expertise or demand to interpret the results from metering.

Where clients of larger property portfolios have carried out limited exercises to monitor the performance of their buildings, in many cases they had to install a secondary metering system, independent of the one incorporated in the building. So whilst metering and extensive submetering is useful in theory, in practice the information provided by meters is expensive to extract and irrelevant in most cases as it is not comparable to the energy end use consumption calculated for an EPC. Most buildings currently do not come with a forecast that could be comparable like-for-like to operational energy use.

Once energy use forecasts that estimate a building's likely actual energy use are mandated, along with the public reporting and benchmarking of energy consumption data, submetering and metering are likely gain far greater priority.



BPIE

Buildings, as the largest energy-demand-side actor, could play a key role in tackling the energy system's challenges, and become active players. In the complex energy system, energy efficiency and innovative technologies such as demand response, storage and advanced renewable installations play a crucial. This could be enabled by technologies such as smart meters, energy management systems (EMS), smart thermostats, and other load-control technology with smart end-use devices.

The smart meters being installed in various European countries should be equipped with support to home networks and allow dynamic price models. End-users and other relevant actors, such as aggregators, ESCOs, installers and energy auditors, should have detailed access to data from smart meters, EPC or building automation systems. With this access, the building performance, comfort and indoor air quality can be further improved.

58. Has the promotion of smart cities, smart buildings, sustainable transport solutions, smart mobility, and similar initiatives been linked with the EPBD and its aims? If so, how?

Key factors to achieving low energy consumption in operation are construction quality and operating conditions, including occupant behaviour. These are the least known and least planned for factors in the EPBD. To facilitate this, operational data must increasingly be reconciled with design forecasts. In terms of the technological tools required to facilitate smart buildings playing an active role in smart cities, there is a major gap between what is achievable in other industries, such as telecommunication or vehicle design and the construction industry.

'Smart' initiatives could also enable participation and learning, and inform users of behaviour consequences.

60. What incentives are missing, that would help promote efficient district heating and cooling or meeting the goals of the EPBD?

The ACE supports the position of the BPIE.

BPIE

Information campaigns on buildings energy use: building owners, be it private individuals, businesses or the public sector, often disregard the potential energy and cost savings from energy efficiency measures. Sector specific information through EU funded programmes have the potential to mobilise decisions that will help meet the EPBDs objectives.

Development of ESCO business models: the private sector and the entrepreneurial spirit of individuals are most suited to exploit market opportunities and facilitate the transition of the EU building stock to less energy intensive levels. Their actions should be supported with financial incentives, market instruments, access to resources, information exchange and platforms that link relevant professions and potential customers.

Energy Savings Obligations targets need to be mandatory and ambitious: Energy companies are very well positioned to offer quality service and keep a steady stream of profits while they undertake energy efficiency measures in favour of the end consumer. The EPBD should reinforce other government actions that aim to assist energy utilities with the delivery of their obligations set forth in the Energy Efficiency Directive. The framework of the EPBD should be set up accordingly so that it effectively channels the actions under the ESO towards the direction of greater savings and towards actions such as eliminating fuel poverty.



61. Have cost-optimal policies been devised that improve the performance of buildings so that they use less heating and cooling, while ensuring a decarbonised energy supply?

The ACE supports the position of the BPIE.

BPIE

Cost optimal methodologies, while conceptually being a great tool, have been undertaken with significant discrepancies. It has essentially become possible to increase or reduce the level of ambition by making use of a rather complex and un-harmonised modelling methodology. The uncertainty of some methodologies and the cloud of possible cost optimal curves do not necessarily guarantee cost optimal levels but rather point towards more consistent and coherent EU buildings policies.

A significant point of improvement regards the evaluation of investment costs, which should be replaced by a more cautious approach towards all building related expenses and savings. Additionally, the cost optimal methodology undertaken by Member States should be supported by EU guidelines according to best practices and aiming for the highest scientific standards.

62. Does the EPBD and its definition of NZEB reflect the requirements that could derive from the energy systems of nearly zero-emissions districts and cities?

No, see 57 & 58

H. AWARENESS, INFORMATION AND BUILDING DATA

63. What do you think of the quantity and quality of information on the importance of energy efficiency provided to consumers by:

1. the European Commission?

The ACE supports the view expressed by the BPIE. The EU's role is to mandate simple and easy to follow measures that remove the current barriers and empower MS and industry to take an interest and responsibility for energy efficiency– such as the requirement to report operational energy use for all sectors.

BPIE

The distance between Europe and the final consumer is very far, and therefore direct communication seems less relevant. In general, there is sufficient information on the EU level on the energy efficiency to (interested) consumers (e.g. EUSEW, Energy Days, many other events). The guidance for the information campaign, could be given on the EC level, but the focus should be given to the regional, local (city) level.

2. national authorities?

There is an overall need to make information available on the co-benefits of energy renovations, such as better indoor liveability, less fuel poverty, more daylight, better indoor temperature, better working conditions, better learning abilities in schools, more social equity since bad indoor comfort



affects the weakest children the most etc. This will increase the “dreams” for improving living conditions and by doing so overcoming at least some of the non-economic barriers identified. All levels have their role to play in informing the different actors. With the current technologies, high-energy performance levels are technically and economically feasible. Unfortunately, the lack of competences and knowledge both at demand and supply side leads to prejudice, wrong planning decisions and wrong execution. Therefore, national authorities should raise awareness and knowledge with instruments like databases with qualified professionals and example buildings, NZEB manuals for different actors, individual renovation roadmaps, marketing campaigns etc.

The ACE supports the view expressed by the BPIE. There is no funding at national level to request and enforce the collection of quality energy use predictions and operational energy use data. Without such data and funding for the continued analysis of such data progress is likely to be slow and patchy.

3. regional authorities?

4. local authorities?

5. local companies?

The ACE supports the view expressed by the BPIE. Exemplars, both projects and companies, should be evaluated based on the actual, not the theoretical energy consumption achieved.

BPIE

Construction companies and installers are often the first and direct link with the consumers, for sure in case of renovation. Companies with the competences to build or renovate with high-energy performance levels should therefore be highlighted (e.g. in public available databases, label schemes...). This could be set up by sectorial federations or by (local) authorities. The most appropriate would be that these schemes are being supported by both government and sectorial federations.

64. Has the directive promoted information on opportunities for consumer-friendly smart meters and interoperable energy efficient appliances?

The ACE supports the view expressed by the BPIE. Any guidance will have to overcome scepticism of current metering technology highlighted by the UK's Building Performance Evaluation programme.

BPIE

No. Right now the provisions from the EPBD are too generic and do not provide enough support to these technologies. Moreover, the industry has already expressed the need of dedicated standards for these technologies, which will be addressed by the Ecolabel directive in the near future.



65. What relevant building data has been collected at EU and Member State level, and city and district level? Who has access to this data?

The RIBA|CIBSE Carbon Buzz platform has collected crowd-sourced data in the UK at national level. There has been talk of a Building Performance Network in the UK, powered by Carbon Buzz or similar digital platform but the lack of funding combined with the absence of regulatory interest in operational energy use data has slowed progress.

The ACE calls for a more transparent and harmonised reporting and benchmarking of building energy use; for the disclosure of building operating performance across all sectors; for the implementation of measurement and verification of energy performance in use; for EPCs to meet market needs and have a transparent relationship to actual energy use; for transparent reporting by MS on building level performance indicators.

The ACE supports the view expressed by the BPIE.

BPIE

- *The national EPC databases of buildings energy certification registers proved to be extremely useful in obtaining statistically relevant insights on the energy performance of the existing building stock; this aspect has been addressed in some EU funded project, such as EPISCOPE and Request 2 Action. Unfortunately, the national EPC databases are mostly not accessible.*
- *Another example is the English Housing Survey; one of the best-case examples of the housing data collection on the national level. These statistics are collected on annual basis and are made public available.*
- *BPIE is collecting, in collaboration with partners, information to develop the Buildings Observatory*

66. How can data on the energy performance of a building and its related renovation work, across its life cycle, best be managed and made available?

The ACE calls for a more transparent and harmonised reporting and benchmarking of building energy use; for the disclosure of building operating performance across all sectors; for the implementation of measurement and verification of energy performance in use; for EPCs to meet market needs and have a transparent relationship to actual energy use; for transparent reporting by MS on building level performance indicators.

Creating digital building passports that track a building's energy history from design to end of life, alongside key contributing factors to energy consumption is proposed. See also response to question 20.

The challenges are the collection and collation of data which at the moment is still expensive and therefore uncommon. There are several semi-publicly funded projects that have achieved some success in gathering and communicating building performance data. Lessons learned from these should form the foundations of a 'data exchange protocol', in line with relevant ISO and CEN standards and harmonised EU reporting metrics and indicators. A data depository should be created and funded with an open API for organisations to develop apps that can make use of the collected data.

As part of the roadmap towards a low-carbon economy, whole life data including embodied, operational and maintenance carbon impact would be very desirable and could be used to formulate the most carbon efficient solutions taking a long term view.



67. Has building data harmonisation been achieved?

No. The ACE calls for a more transparent and harmonised reporting and benchmarking of building energy use; for the disclosure of building operating performance across all sectors; for the implementation of measurement and verification of energy performance in use; for EPCs to meet market needs and have a transparent relationship to actual energy use; for transparent reporting by MS on building level performance indicators.

68. Is there a need for a central EU database of EPCs and qualified experts?

Yes, the ACE supports BPIE's position here, with the addition that operational data must be collected alongside calculated figures to close the feedback loop between expectations and outcomes.

BPIE

Yes, there is a need for a central EPC and qualified experts database on national level. The EC should impose the Member States to gather all information on EPCs in national databases, and make (a selection) of data available on a central EU database.

A well-functioning EPC system accompanied by an EPC database provides a ready-to-use source of information on the building stock. There is an increasing number of the best practices across Europe that demonstrate the added value of the EPC data for policy making (e.g. to inform relevant renovation strategies) and monitoring, as well as market and research analysis. The EPC databases should be publicly available (including private data protection) in order to serve the wide range of the stakeholders.

There is need for guidance in the development of centralised EPC registries, not only to support the independent control system, but as a tool to map and monitor the national building stock. Therefore, the European Commission should provide further recommendations and enable the exchange of best practices towards functional EPC databases (i.e. methods for data collection and analysis, protocols for data sharing).

I. SUSTAINABILITY, COMPETITIVENESS AND SKILLS IN THE CONSTRUCTION SECTOR

69. How does the construction sector cost-effectively demonstrate and check compliance with the EPBD while also upgrading the skill and knowledge of tradespeople and professionals?

The transposition of the Directive into national regulations has been an impetus for all actors who have been forced to improve their training on their fulfilment. However, the crisis in the sector since 2008 and the lack of business expectations, has halted its deep transformation towards modernization. Therefore, the construction sector in most MS still has a long way to go in improving the knowledge and training of all actors in the process to implement saving measures and energy efficiency.



71. Are energy, materials, waste and water use addressed in the EPBD?

No, not currently, but there is a need for a road map for reporting of operational energy use in the context of a building's overall lifetime carbon and energy footprint.

J. BUILDINGS SYSTEMS REQUIREMENTS

72. Based on existing experience, do you think the setting of minimum requirements in the EPBD for technical building systems is missing? Would have technical building systems minimum requirements contributed to the improvement of buildings' energy performances?

The ACE supports the positions of the Coalition for Energy Savings and BPIE.

Coalition

From a general perspective, more cross-referencing needs to be done between legislation on product energy efficiency at EU level on the one hand, and installation requirements at national level on the other. Looking at the EPBD as such, a twofold approach should be adopted, which sets requirements on the technical systems and on the information to be provided to owners, occupiers and managers of buildings. Moreover, Member States should be required to extend requirements for lighting systems from the non-residential to the residential sector and to promote the use of demand response. The Ecodesign Directive and its implementing measures regulate the energy efficiency of heating and cooling equipment on an individual product level and ensure as such a good foundation. However, the energy performance of technical systems is also closely related to the design, sizing, installation, maintenance and use of the equipment. This creates gaps between the expected and the actual performance of systems and equipment. The EPBD offers great potential to bridge these gaps, and, by doing so, to maximise the energy efficiency of buildings. From a general perspective, Member States should be encouraged to promote replicable solutions for systems, since it is difficult to set requirements at system level due to the great diversity of systems and buildings. More concretely, they should for example:

- *Set requirements for the design, sizing, installation, control & maintenance of systems;*
- *Set requirements on continuous monitoring and online performance measurement;*
- *Build on the existing inspection requirements (Article 14/15) and extend these requirements to HVAC equipment above a certain size;*
- *Promote the use of operation and maintenance contracts.*

BPIE

Setting minimum requirements for the performance (not for specific technical characteristics) of technical building systems could contribute to improvement of buildings energy performance. However, the use of efficient technologies cannot be effective if they are not accompanied by a proper building envelope, which will prevent the energy leakages. Therefore, when setting new requirements a holistic approach should be considered.



73. Based on existing experience, do you think in the EPBD minimum requirements for technical buildings systems focussing on other factors than heating, air condition, large ventilation systems and domestic hot water e.g. certain building categories, building size, etc., is missing?

There is insufficient emphasis on the importance of commissioning building systems and evaluating the long term risks associated with complex technical installations.

74. Based on existing experience, do you think in the EPBD requirements is missing for regular inspections of the technical building systems to ensure:

a. that systems' performance is maintained during their lifetime?

In some MS the inspection of technical systems is already a requirement however non-compliance rates are high. Unless the cause of this is tackled there is little point in increasing inspections.

b. that owners/occupiers are properly informed about the potential improvements to the efficiency of their systems?

The ACE supports the position of the Coalition for Energy Savings:

Informing owners, occupiers and managers of buildings about the best ways to improve energy efficiency, together with regular servicing, maintenance and inspections of buildings' energy systems would ensure that equipment is optimized to its efficiency potential and that configurations are done correctly. For example, if actual energy consumption is measured and differs from the expected consumption (based on design), there should be an explanation given on the reasons and if necessary, advice should be provided to consumers on how to adapt their behaviour. This can be done with the help of adequately educated installers, building construction experts, operators of the energy systems, representatives of the owners and users. A realistic energy consumption baseline reflecting a building's actual operating conditions, including all energy end uses, should be provided for all new buildings in order for users to be able to reconcile actual performance with design expectations.

K. OPERATIONAL MANAGEMENT AND MAINTENANCE

77. Based on existing experience, does the EPBD promote the key ways to ensure that buildings meet stringent efficiency targets in their operation?

No, the targets set by the EPBD do not account for operating conditions nor for construction quality. Studies show that buildings consume on average 1.5-3 times more energy than calculated. Without the requirement to report operational energy use the EPBD lacks bite.

78. Based on existing experience, does the EPBD promote the best way to close the gap between designed and actual energy performance of buildings?

Significant research effort is focused on highlighting and closing the gap between the expected and achieved energy performance improvements of buildings and the effectiveness of existing legislation and standards to achieve this.

Current EU energy legislation is not targeting reductions in measured energy use. Instead the



EPBD requires MS to develop complex calculation metrics that assess a building's energy consumption potential. To comply, built environment professionals only need to demonstrate that their proposed design can achieve improvements against a notional building under idealised operating circumstances. As compliance calculations are the only mandatory calculations required to assess energy performance, factors relating to construction quality, occupancy and management are routinely omitted.

Evidence shows that the impact of these factors is greatly underestimated and the lack of planning for measured energy use has significant unintended consequences. There is a growing tendency for more compact space allocation, smaller opening sizes and a greater mechanisation of buildings with greater reliance on complex control systems and low/zero carbon technologies. However assessing the impact of these on occupant comfort, building management and whole life costs is not required, often resulting in poorly integrated solutions. In practice these bring a much greater risk of increased energy consumption, occupant discomfort, higher maintenance costs and a loss of productivity [see CarbonBuzz + UK Technology Strategy Board Building Performance Evaluation data].

The approach to energy conversation advocated by current legislation has resulted in a poor appreciation of the resilience of historic buildings, especially when we consider likely climate change impacts, in particular overheating. An integrated approach to low energy refurbishment and new build is required to create more resilient buildings – and architects are best placed to lead this. It is the traditional role of the architect to balance the complex factors of context, building fabric, technologies and occupants.

As feedback from buildings in operation is not mandated by regulation the effectiveness of investment in low carbon measures are not quantified and do not inform policy and procurement. Such data needs to underpin future legislation and investment in carbon and energy saving measures. Greater harmonisation of reporting metrics is required to allow the gathering of valuable statistical evidence from the refurbishment and construction of new buildings. Mandating the disclosure and benchmarking is necessary to incentivise collaborative working practices needed to achieve an EU building stock that requires significantly less energy in use and is resilient to the changing climate and demographics.

79. Based on existing experience, are the provisions provided by the EPBD to stimulate a proactive, innovative maintenance market effective?

No, unfortunately there appears to be a major disconnect between capex and opex operations in all sectors even for owner occupiers.