



### Strategic Priority 3 - Responsible Architecture

EU Commission's Communication for a EU Heating and Cooling Strategy

ACE policy position

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#### BACKGROUND

On 16 February 2016, the EU Commission published a Communication presenting a new EU Strategy on Heating and Cooling, addressing the energy used for heating and cooling in buildings and industry. The Strategy aims to make "the sector smarter, more efficient and sustainable" in order to reduce energy imports and emissions, while cutting costs.

"Heating and cooling" refers to the energy needed for warming and cooling buildings, be them residential or in the service sector (eg. schools, hospitals, office buildings). It also includes the energy which is necessary in industrial processes to produce products we use in our everyday life as well as cooling and refrigeration in the service sector.

#### HIGHLIGHTS

- ACE welcomes the Communication's equal emphasis on the provision of both sustainable heating and cooling for the EU building stock.
- The document however does not appear to take into sufficient consideration the feedback from building performance evaluations, pointing to the high level of expertise required to implement and maintain such systems and the risks and costs associated with this.
- ACE would welcome more extensive reference to the architectural determinants to building performance and their contribution to long-term building resilience.
- Post-occupancy evaluations show that a much greater focus on occupant experience is needed to achieve a step change in building performance. The current Communication refers to building occupants under the 'barriers' section rather than being the key focus of innovation and investment.
- Architecture is currently the only built environment profession with a mission to meet occupant needs. It also is the only one qualified to synthesise innovation from building services, construction methods and spatial and material configurations that can accomplish this.
- ACE advocates the systematic use of feedback from completed projects in order to prevent market distortions and the undermining of architectural quality.



## REPORT

### ❖ Introduction

The ACE welcomes the Communication's equal emphasis on the provision of both sustainable heating and cooling for the EU building stock. The ACE notes the document's assumption that the solution to this challenge may be the wide-spread application of 'smart' (electronic) controls to heating and cooling systems. The document however does not appear to take into sufficient consideration the feedback from building performance evaluations, pointing to the high level of expertise required to implement and maintain such systems and the risks and costs associated with this. The ACE would endeavour to highlight the need to recognise the long-term financial implications of the reliance on smart systems and the need to develop financial and professional infrastructure for the benefits to be realised.

Building performance evaluations carried out extensively across the EU demonstrate that electronic controls are one of the greatest risks of excessive energy consumption in new buildings and refurbishments and are often the source of poor indoor environmental quality too. Such studies demonstrate that projected savings for automated mechanical solutions to energy efficiency rarely achieve their predicted savings. Since the introduction of the EPBD, building energy use legislation actively incentivises electronic solutions to environmental control over passive means and electricity consumption used for the supply of fresh tempered air to buildings has actually increased as a result while reduction in heating consumption has not reduced in line with expectations. While the document highlights the concern that it is buildings' cooling requirement that is likely to grow, which has to be met from carbon-intensive electrical supply, it appears to have underplayed the importance of passive architectural means to achieve improved occupant comfort, usability and productivity.

ACE would welcome more extensive reference to the architectural determinants to building performance and their contribution to long-term building resilience. The document does contain a reference to 'architects' in the context of 'incorporating advanced design and smart technologies' into buildings. However this is a reference to the application of insulation & lighting measures only, whereas research shows that the configuration and materiality of buildings has a formidable impact on the perceived comfort and well-being of occupants.

Post-occupancy evaluations show that a much greater focus on occupant experience is needed to achieve a step change in building performance. The current Communication refers to building occupants under the 'barriers' section rather than being the key focus of innovation and investment. Given the status quo regarding the EPBD, it is not surprising that the operational phase of buildings is under-represented – however architects traditionally focus on occupants' experience and the usability of buildings. No other member of a project team is geared up to champion the end user.

ACE advocates the systematic use of feedback from completed projects in order to prevent market distortions and the undermining of architectural quality.

As for the 'market makers' – the document introduces these as the 'installers' and agrees that they lack the expertise to make 'smart' solutions work in reality. The paper also refers to the fact that it is difficult to compare the effectiveness of low carbon technologies (and measures) but fails to highlight the lack of evidence from validated building performance in operation that could overcome this.



There is increasing evidence of the impact of design and architectural quality on occupants' perception of thermal comfort and air quality. Architecture is currently the only built environment profession with a mission to meet occupant needs. It also is the only one qualified to synthesise innovation from building services, construction methods and spatial and material configurations that can accomplish this.

#### ❖ Incentives

The Communication does recognise that investment in the thermal envelope is best made *'when they are done as part of other building works'*. The ACE would welcome a more in-depth discussion of this to acknowledge that incentives for quality building envelope need to be aligned with the functional and spatial reconfiguration (or configuration for new build) of buildings.

UK studies have shown that energy efficiency retrofits, targeting the 'low hanging fruit' of attic and wall insulation and new glazing show only a benefit of between 5-10% energy use reduction – owing partly to the fact that once a building is better insulated, owners tend to opt for higher indoor temperatures in the winter and lower in the summer. The importance of designing for adaptive comfort both in summer and winter could be further highlighted alongside the need to acknowledge the growth in cooling requirement for light-weight, low floor to ceiling height buildings and the tendency to undersize openable façade areas (windows). It is essential that legislation stops focusing on simple fabric measures and incentivises the functional and architectural renovation of the building stock – tying incentives to actual reductions in energy use and higher occupant satisfaction/indoor environmental quality.

#### ❖ Ownership models

The model of Energy Performance Contracting referred to in the document should include the application of operational energy use targets to architectural projects. These have been shown to significantly improve energy efficiency and raise the quality of design as well as construction quality. A broader study of the impact of EPC on architectural and spatial quality needs to be carried out to fine-tune renovation incentives for different ownership models.

#### ❖ Financial incentives

Significant improvements in building energy performance can only be achieved if financial and regulatory incentives are targeting all three pillars of building performance: low energy consumption, high indoor environmental quality and occupant satisfaction.

However the bulk of this section is focused on Smart Technologies & distribution grids. Due to the high capital cost and continuous expert input required for such systems a significant gap has emerged between the expected and achieved performance of 'smart' buildings. In the UK for example, new buildings and refurbishments on average consume 2-3x more than designed due largely to the shortcomings of automated energy efficiency solutions.

Existing investment models do not highlight the construction and maintenance risks associated with these solutions nor their disproportionately high whole-life cost. Nor is the technical expertise routinely available to design, specify, install, commission and operate such systems as assumed by manufacturers. As a different party is responsible for the success of each of these stages there is no clear chain of responsibility, leaving few



incentives for any supply chain actor to deliver professionally.

For smart technologies to deliver real-term improvements in building performance, funding needs to re-focus on revolutionising the interface between a building and its occupants. By regulating only a notional building performance this area will continue to be overlooked by industry at the detriment of achieved energy performance in use.

There is another fundamental issue with the disproportional focus on smart solutions: the status quo investment in energy efficiency is routinely absorbed by complex technical measures while integrated architectural solutions, required for the long-term resilience of a building, are overlooked, under-funded and value engineered.

Without a regulatory requirement for disclosing achieved performance the industry lacks incentives to convert the energy consumption potential of a building into reality. Mandating the disclosure of operational energy use is a simple way to re-align the diverse incentives of one of the most fragmented economic sectors.

The paper seems to imply that instead of investment in robust legislation that incorporates measurement and verification, 315 billion EUR will be allocated to sustainable energy projects. M&V alongside a building performance data infrastructure validating claimed performance improvements should be one of the key strategic priorities of the EU. The PassivHaus standard, while not perfect, is currently the only 'design standard' used in the EU that commands the respect of experts, due to its inherent focus on operational outcomes (for heating) and addressing risks affecting these. Unsurprisingly, it enjoys an exponential up-take amongst architects. However, having been developed for application in Northern Europe, the standard requires adaptation for other climatic zones in the EU, where overheating is the primary environmental design focus.

The Smart Finance for Smart Buildings initiative must recognise the risks associated with purely technological solutions to energy efficiency that ignore the cultural, social and architectural mechanisms required to transform the construction and property sector bottom-up. Studies indicate that the main reason that the energy efficiency market has not been able to mature is because it has been subjected to inconsistent incentives that require no validation of achieved performance. This in turn would lead to more holistic financial incentives for achieving better quality of life at a significantly lower energy and resource use.

#### ❖ Heating and cooling equipment

There is a well-evidenced gap between the expected and actual performance of 'energy efficient' heating and cooling technologies and the industry is ripe for a Volkswagen style scandal – with the finger of blame likely to be ultimately pointed at legislation that does not require the validation of achieved performance in use.

The Communication uses the term 'should bring improvements' – surely, the Commission should not be seen to be promoting solutions and technologies that have no proven record in bringing about significant improvements in operation.

Building performance evaluation studies have shown that the benefits of low carbon technologies do not meet their assumed efficiency in practice. Their efficient operation requires expert design, installation, commissioning and operation the cost of which is not acknowledged.



#### ❖ Sectors

When discussing the potential of different sectors to improve energy efficiency in their building stock it is important to view investment in energy efficiency in the context of the sector's overall investment in construction and renovation. When the requirement for measurement and verification of performance is in place, the proportion of spend required to achieve actual reduction in energy use is negligible – and the property sector clearly states that if the requirements were there they would be able to rise to this. However, without a level playing field, this will not happen, hence the need for 'Disclosure, Disclosure, Disclosure'.

It is important to note that the mechanism of disclosure needs to take into account sector specific structures of responsibility and metrics in order for disclosed energy use data to be comparable. (i.e. landlord tenant boundaries, metrics for hours of operation, occupancy, useful area)

#### ❖ Innovation in energy supply and distribution

There is clearly a great potential in this and barriers to energy generation in buildings must be robustly addressed including energy storage and linking buildings to smart distribution networks. Given the construction industry's adversity to risk, monitoring the success of district level innovative solutions and disseminating lessons learned is essential.

More evidence is needed on the benefits of district heating and cooling systems and the effect of these on consumption patterns – without a step change in the understanding of user interface and maintenance requirements, performance improvements will continue to fall far short of forecasts.

The reporting of the embodied impact of microgeneration/storage equipment, their maintenance requirements and lifespan as well as end of life disposal will become a prominent issue that requires forward planning.

#### ❖ Smart buildings

As stated in the response to the 'Financial Incentives' section, this is a territory with much potential but severe under-investment in terms of interface design. Optimistic assumptions of installer/user/equipment interaction are responsible for major shortfalls in assumed performance gains and significant loss of credibility for such technologies. Investment in smart metering, benchmarking and diagnostic systems are needed with incentives for building owners, users, operators and agents, policy makers to take an interest in interpreting the results.

#### ❖ Tools and solutions

Recognition of the importance of the cooling sector alongside the heating sector is a positive step. Research funding needs to target passive means of reducing cooling requirements through better spatial configuration and standards as well as other innovative passive technologies. The ACE recommends that the Commission's approach is underpinned by the recognition that architecture has a major role in reducing cooling requirements. This is especially critical in a warming climate where cooling requirements are already rising. The incorporation of VALIDATION of performance, i.e. measurement and verification appears to be absent from these priorities, which is essential for



performance benefits to materialise.

#### ❖ **Buildings**

Energy Performance Certificates have suffered a major credibility loss due to their lack of relationship to actual building performance. Strengthening the reliability of EPCs must incorporate validation of performance in use – this is the ‘elephant in the room’ for the property sector. Any other tightening of the current regulations will only add cost to the implementation new recasts and face resistance from MSs.

Any toolbox of measures need to incorporate an architectural and functional upgrade of existing properties in order to achieve a step change in renovation rates. (note the value of the retrofit market in terms of reconfiguring dwellings: currently walls are taken down, new bathrooms and kitchens are installed, new finishes applied, rooms re-decorated and heating systems are changed without serious consideration of reducing heating and cooling demand)

It would be helpful for the communication to set out in greater detail what the commission considers to be ‘proven energy efficiency models’ and how these are ‘proven’ to qualify as such.

Non-compliance for boiler inspections is extremely high.

Voluntary certification scheme for non-residential buildings MUST include validated performance in use.

When preparing the review of the EE legislation and the electricity market design initiative in 2016 the Commission needs to consider engaging users through validated improvements in indoor environmental quality, which engages end users more than energy consumption. Inevitably, architectural quality will emerge as an important contributor to that and educating energy providers in this is going to be challenging.

With a rapid growth in the reporting of indoor environmental quality factors via hand-held devices there is a risk that without the requirement for energy disclosure, improvements in indoor environmental quality will be demanded by the market, while energy priorities will recede. The role of legislation is essential to ensure that improvement in indoor environmental quality does not occur at the detriment of greater resource consumption.

#### ❖ **Renewable-based and efficient heating and cooling**

It is important to note that the role of the Commission is to provide a legislative framework that provides a low-cost incentive for well-working technologies to be developed and taken up by the market. Quality assurance needs to be based on the collection and distribution of measured data as to the effectiveness of different solutions. EU Institutions can stand back from declaring any ‘low-carbon’ heating and cooling technology as superior – these are likely to be different in different climatic zones and cultures.

Measurement and verification of indoor environmental quality and the resources required to achieve this (data collection, analysis, joined up industry and academic research and benchmarking) along with financial rewards for achieved improvements (VAT reduction, cash rebates, etc) must be at the core of the commission’s strategy here.





#### ❖ **Smart systems**

As long as district level data can be validated, smart systems will inherently find their own value in this framework (more likely to be taken up by ownership models where maintenance lifecycle stage enjoys higher funding and expertise).

As part of the Electricity Market Design, Renewable Energy Directive and EED reviews, the Commission MUST implement the measurement and validation of achieved performance in use.

#### ❖ **Innovation**

One of the greatest potential for innovation is the overlap between the architectural and performative reconfiguration of existing buildings in the context of changing occupant spatial and functional needs. With the advent of technology, enabled feedback loops (including low-cost devices to monitor human comfort & indoor environmental quality), the link between building performance, architecture and value is likely to strengthen. To ensure that improvements in indoor environmental quality are coupled with lower energy use the Commission must enforce disclosure of performance benefits. The energy and construction sector is ripe for major innovation in terms of interface and product design – based on the recognition of an integrated (architectural) approach to achieving energy efficient buildings. The Commission can and should do more to incentivise this.

#### ❖ **Financing**

In encouraging Member States to establish advisory services, project development assistance and financing, the engagement and retention of an architect from building design to operation should significantly reduce the risk rating of such investments (i.e. lower risk).

#### ❖ **Conclusions**

This document has an opportunity to introduce an approach to heating and cooling that would result in a step change in improving long-term building performance, improve building resilience in the age of climate change and reduce maintenance costs.

The conclusion of the document states that consumers must be at the centre of this strategy yet the paper describes an approach to energy efficient heating and cooling that is largely based on a the legislative status quo that disregards feedback from buildings in use and regards occupants as a barrier rather than an opportunity. As such, it risks further investment targeting solutions that high performative risks while increasing whole life costs.

## **ANNEXES**

- [Communication for a EU Strategy on Heating and Cooling](#), in all EU languages