

# Introduction to Panel 6

## Buildings policies, directives and programmes

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### Introduction

Buildings represent the largest energy-consuming sector in the global economy, accounting for over one-third of all energy and half of global electricity. As such it is a major focus not only for climate policy, but also for delivering energy security and economic efficiency. Under business-as-usual projections, global energy use in buildings could double or even triple by 2050. This will be due to increases in wealth, lifestyle changes, access to modern energy services and adequate housing, and urbanisation.

Advances in technologies, know-how and policies provide opportunities to stabilize or reduce global buildings sector energy use by mid-century. However, strong barriers, such as split incentives, fragmented markets and inadequate access to information and financing, continue to hinder the market-based uptake of cost-effective opportunities for both new and existing buildings.

The EU has an important role to play in setting an example in both policy design and effective implementation, primarily for existing buildings. In its 2011 *Roadmap for Moving to a Low Carbon Economy in 2050*, the European Commission explored pathways to meeting its climate change commitment of an 80–95 % reduction by 2050 over 1990. The analysis implied reductions from the building sector of some 90 % by 2050. The policy framework in the EU together with accompanying national policies are in place which will help deliver this, but they will not be sufficient. In February 2016, the European Commission proposed an EU heating and cooling strategy emphasizing energy efficiency measures and a shift to RES-heating and cooling (RES-H/C) supply technologies and in October 2016 the Commission came out with a new energy efficiency package recommending changes to the pol-

icy framework. Thus, this is an opportune point to review and analyse the current policy framework and assess what is needed in the buildings sector to move towards a low-carbon economy.

A large number of interesting abstracts were received. The final selection for the panel comprises twenty-one papers and one display paper. These can be divided into five broad categories according to their main concerns:

- Policy impact and instrument design
- Multiple-benefits of energy efficiency
- Modelling and scenarios
- Energy efficiency potentials
- Costs and financing

### Policy impact and instrument design

Six papers analyse the impact of existing policies and the crucial elements of designing sound instruments. Sebi et al. (6-138-17) compare the policy mix used to promote retrofitting of existing buildings in three countries: Germany, France and the United States. The paper thus considers in Germany the use of grants and loans alongside labelling, heating checks and technical specifications; in France the trajectory for mandatory minimum building energy performance standards and, in the US, the combination of rating and disclosure of energy use, financing, and technical assistance.

The cost effectiveness of programmes designed to upgrade energy technologies can be significantly affected by free riding.

Olsthoorn et al. (6-021-17) quantify the extent of free riding and its effect on the cost effectiveness of a rebate program promoting the adoption of energy efficient heating systems, based on analysis of choice experiments carried out through surveys in eight EU Members States.

Jahn and Rosenow (6-129-17) suggest a new financing mechanism based on property transfer tax. The selling and purchasing of a home is a critical trigger point for making refurbishments: linking property transfer tax (PTT) to the energy performance of the building could provide an important demand driver and financing mechanism for energy efficiency. The authors focus on the United Kingdom and Germany to illustrate how an energy efficiency PTT could work in practice.

Bright et al. (6-283-17) are concerned with refurbishment of mixed tenure buildings. The paper analyses challenges and barriers to deep retrofits based on refurbishment programmes in apartment blocks with private and public ownership in the UK. The authors illustrate how policies can smooth decision making, financing and management of such retrofit projects.

Regulatory policies on energy efficiency in buildings are prescriptive or performance based energy standards in most countries that do not consider the use of energy once the building is in operation. Feng et al. (6-156-17) review best practices of outcome based energy standards and model the impact of changing from prescriptive to outcome based standard in China.

Fabbri (6-227-17) considers a new policy mechanism – the Building Renovation Passport (BRP) as an evolution of EPCs. The BRP outlines a long-term step-by-step renovation roadmap for a specific building. This paper discusses the BRP concept and then explores progress towards its implementation in Germany, France and (in most detail) Flanders.

### Multiple benefits of energy efficiency

Four papers explore some of the multiple benefits from energy efficiency measures. Brocklehurst (6-033-17) analyses the impact of energy efficiency measures on the property value of residential buildings by reviewing the recent research in 15 European countries.

The importance of health issues and comfort is presented by Beranova et al. (6-076-17). The Healthy Homes Barometer from 2015 and 2016 is a very large scale pan-European study investigating citizens' attitudes and behaviour regarding home comfort and energy consumption. This paper presents findings from the survey focusing on attitudes to different aspects of a healthy home, such as air quality and natural light.

Security of supply is an under-examined benefit of energy efficiency programmes. Making an important new contribution, Staniaszek et al. (6-104-17) explore the susceptibility of the building sector to gas supply interruptions in South East Europe, and how energy security can be considerably improved by drastically reducing demand for gas through a targeted building renovation programme.

Ordonez et al. (6-383-17) discuss the capability of energy efficiency policies to remove specific barriers for investment in retrofitting low income households as well as the wider benefits (environmental, economic, and social benefits) of policies and programmes targeting this group of households. This study

consists of an analysis of the current energy efficiency policy landscape in the EU and its member states.

### Modelling and scenarios

Four papers deal with the long term transition of the building sector by presenting scenarios for the future development of the energy demand considering different policy trajectories. Kranzl et al. (6-366-17) review ambitious scenarios of energy demand in buildings and analyse if the projections are in line with the COP21 target of 80 % to 95 % reductions in GHG emissions up to 2050. Scenarios even beyond 2050 are developed by Levesque et al. (6-097-17). The paper presents an energy demand model to investigate plausible scenarios for buildings' energy demand until 2100.

Two papers are concerned with achieving the policy goals in Germany. The building sector will need to be almost entirely decarbonised to achieve the goals of the German Energiewende (energy transition). Using a model of the German building stock, Bürger et al. (6-040-17) develop different visions (target states) of what a nearly climate-neutral building stock could look like. Mellwig et al. (6-119-17) model potentials and restrictions of energy efficiency measures as well as renewable heating technologies in order to derive the right balance between "efficiency first" and the deployment of renewable energy sources.

### Energy efficiency potentials

Five papers address the potential for further energy savings in buildings for different segments. Villarejo and Gámez (6-126-17) identify energy saving potentials of protected heritage buildings in the area of Madrid and present a method to carry out an initial assessment of the heritage building stock in other regions and countries.

Toleikyte et al. (6-229-17) focus on shopping centres in Europe. The paper analyses the current building stock of European shopping centres and presents different policy scenarios for the development of its energy demand until 2030. The authors derive specific policy recommendations to realise saving potentials of this sector.

Schramm et al. (6-128-17) analyse saving potentials from optimising the control of technical building systems that require usually much lower investments than insulation of buildings. The scope of the analysis is optimizing system performance by control of energy generation, distribution and emission of heating and cooling energy.

Korytárová et al. (6-187-17) show the results of an analysis of energy savings potential in public buildings in Slovakia until 2030. The analysis is based on a bottom-up model taking a performance-based approach to modelling energy consumption. The authors go on to discuss the need for an appropriate policy mix to increase the rate of retrofitting.

As the energy performance of the existing and new buildings keeps improving, the share of the construction process in the overall climate impact of buildings increases. Rootzén and Johnsson (6-215-17) are concerned with this topic. The paper discusses innovative technologies, business models and policies to lower GHG emissions in the construction and building materials industries.

### Costs and financing

Three papers address costs and financing of efficiency measures. Osso et al. (6-090-17) apply a statistical model in order to estimate the effect of different technical, economic and macro-economic variables on the up-front costs of heat pumps.

Bleyl et al. (6-369-17) use a bottom up approach to examine the economic and financial implications of a domestic energy retrofit project, mainly from the perspectives of investors and financing institutions. The authors analyse how an analysis of

multiple benefits can make the business case more attractive and consider implications of their findings for policy makers.

Schlein et al. (6-146-17) assess barriers to the deployment of private capital for building energy efficiency projects in Europe, the United States, and China. The paper presents recent example of success and lessons learned from exploratory work to pilot new financing mechanisms that allow capital markets to better assess and bear the technical and credit risks of projects.