Why building retrofitting?

The buildings sector has been identified as a key area to be addressed in order to meet the EU’s 2020 targets of increasing the use of Renewable Energy Sources, as well as increasing the gains that can be made through Energy Efficiency.

Europe’s building stock is made up of about 160 millions of buildings\(^1\). This large, rather old building stock (over 80% are older than 10 years\(^2\)) is responsible for 40% of Europe’s total primary energy consumption and 30% of greenhouse gas emissions. The refurbishment of these buildings is therefore crucial to reach the ambitious objectives of the Europe 2020 strategy.

A substantial share of the stock in Europe is older than 50 years: more than 40% of the residential building stock has been built before the 1960s when energy building regulations were very limited. Countries with the largest share of older buildings include the UK, Denmark, Sweden, France, Czech Republic and Bulgaria. In addition, because of the large boom in construction in Europe in 1961-1990, the housing stock more than doubled in this period.\(^3\)

Building energy performance is related to the performance of the installed heating and ventilation system, the building envelope, the climatic zone that it is in, the behaviour of the occupants and the social conditions that relate to it. The Buildings Performance Institute Europe (BPIE) report suggests that “the largest energy saving potential is associated with the older building stock where in some cases buildings from the 1960s are worse than buildings from earlier decades.”\(^4\)

The key to greater energy efficiency are residential buildings which represent about 80%\(^5\) of the total building stock and 63% of final energy consumption. The current retrofitting practices of residential building pose a variety of challenges to the construction sector and leave considerable room for improvement. Most solutions available in the market only offer thermal insulation, have low aesthetics and are rather uniform in terms of applicability to different typologies of buildings and to different façade orientations. Climate and energy needs are also not properly considered and they tend to make little use of innovative passive and active technologies.

According to EuroACE, in 2050 more than 90 percent of today’s buildings will still be standing and occupied, thus making the renovation of these building into low energy buildings a crucial element to make the EU shift towards a low carbon economy.

The EU policy context

There are mainly three EU directives that are relevant to the energy performance in the building sector in Europe.

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1. Mattering international issue, 1 2005
5. NMP Work Program 2007
The Energy Performance of Buildings Directive

The key directive that relates to buildings is the Energy Performance of Buildings Directive (EPBD) directive dating from 2002 with a recast in 2010. The recast of the directive strengthens some aspects of the text and sets out stricter rules for EU Member States.

Some of the key aspects are that after 2020 all new buildings will have to be nZEB (Nearly Zero-Energy Buildings) and comply with high energy performance standards as well as using a strong amount of Renewable Energy Sources (RES). The directive especially identified public buildings, with a specific deadline of 2018.

Some of the changes are in the directive are:

- Development of a comparative methodology framework for calculating cost-optimal levels of minimum energy performance requirements for buildings and building elements.
- Extension to all buildings (removal of 1000m² floor area threshold) of requirement to set minimum energy performance levels when a major renovation takes place, including for building envelope elements that are retrofitted or replaced.
- All new buildings to be nearly zero energy level by December 2020 (December 2018 for public authority buildings).
- Requirement for Member States to list financial incentives in place to enable the transition towards nearly zero energy levels in buildings.
- Mandatory energy certification for all properties constructed, sold or rented out, and for all public buildings over 500m² or those frequently visited by the public.
- Enhanced heating and cooling system inspections and reporting requirements.
- Requirement for Member States to establish penalties for non-compliance.

The Energy Efficiency Directive

The Energy Efficiency Directive is the most recent EU legislation which aims to contribute to achieving the 2020 energy efficiency target by addressing buildings. With proper implementation, it is expected that the directive will contribute to 75% of the energy efficiency improvements needed to reach the 2020 target.

There are two points that relate to buildings:

- The public sector is required to renovate 3% of buildings "owned and occupied" by the central government in each country. Buildings need to have a useful area larger than 500m² in order to be covered by this requirement (lowered to 250m² as of July 2015).
- EU countries are requested to draw up a roadmap to make the entire buildings sector more energy efficient by 2050 (commercial, public and private households included).

The Renewable Energy Directive

- The Renewable Energy Directive is also relevant to buildings. The directive sets mandatory national targets for share of RES by 2020 for member states.
- Introduction of RES in national strategies.
- Minimum RES levels for new and existing buildings by end 2014.
- Public buildings to lead by example from the beginning of 2012.
The types of financial programmes and incentives in the field of energy efficiency in Europe have been identified as: grants/subsidies/funds, preferential loans, tax and VAT incentives, obligations and white certificate schemes, third party financing, levies, audits and minimum requirements and penalties. Almost all of these in fact also relate to the building retrofitting field.

**Market for building retrofitting**

The market for retrofitting has been growing steadily over the past couple of years, although this has not been happening at the same rate and speed globally.

According to a report from Pike Research, this global market will expand from $80.3 billion in 2011 to $151.8 billion by 2020. In the same report, retrofitting is identified as one of the most cost-effective ways to reduce operational costs and the variety of financial instruments being set up to support the process of energy efficiency retrofitting will enable the market to grow. Western Europe is identified as the biggest market of retrofits for energy efficiency but it will experience a drop in the global share it currently occupies, dropping from 41% in 2011 to 37% in 2020 in global revenues in EE retrofits. Asia and the US will increase to $54.6 billion and $35.3 billion respectively by 2020.

**Constraints for energy efficiency and building retrofitting**

Despite the high interest in energy efficiency investments and prioritisation of the building sector as key area to tackle to achieve carbon emission reductions and energy efficiency goals, there are a number of constraints that need to be overcome in order to support the market take-up of these technologies and techniques.

When focusing on the renovation of the existing stock, the barriers that emerge mainly fall under 4 categories. The graph below summarizes the categories.

![Classification of barriers as identified by the BPIE survey](http://www.navigantresearch.com/newsroom/the-market-for-energy-efficiency-retrofits-in-commercial-buildings-will-nearly-double-by-2020-reaching-152-billion-worldwide)
Each of the categories has different elements that enable or hinder the market uptake of renovation activities. The BPIE survey\(^7\) identifies financial, institutional and administrative, awareness/information and split incentives as the main categories of barriers that building retrofitting faces.

Financial barriers are listed as the most important, but informational barriers, (which enable the market to act a certain way) are also identified as crucial. As the survey states “[...] alternative investments are in many cases preferred to energy saving measures due to the lack of awareness, interest or in fact, ‘attractiveness’ of energy efficiency as an investment option. For the market to work well, correct and appropriate information is essential.”

**Market barriers for building retrofitting**

Market barriers must also be taken into account when addressing the deployment and uptake of retrofitting practices. Uncertainty in the market is a key barrier for building retrofitting. As is the case in other subsidised and publically supported schemes, consistency in the support offered as well as guarantees that the support will not be abruptly interrupted would enable stakeholder to have confidence in their investments and support received over time, thus continuously supporting the successful emergence of the market.

The BPIE report identifies market barriers that can give rise to “latent risks”. These risks are the type that can emerge in case the demand for building retrofitting increases and these risks are not accounted for. They are important to take into consideration, as they may inevitably rise once the other barriers have been bypassed successfully. Examples of a latent risk that may emerge in case the uptake of retrofitting practices increases are shortages that technologies may encounter relating to materials, components and human resources. Additionally, the supply chains and delivery systems can face problems to increase their efficiency to cope with the demand.

Overall, the ability of markets to respond to changes and mitigate risks is related again to confidence in the markets and appropriate signals that are given in consistent ways and with a long-term vision.

However, as pinpointed in the THINK report\(^8\), even if a well-functioning market is operating in all Member States, not all building owners will find it economical to renovate their properties. To deliver the renovation targets, the authors therefore suggest putting in place regulatory policies to remove distorted energy prices, provide standards and harmonize energy performance certificates, but also to coerce some actors to renovate by policy.

**Market players and emerging financing models**

The main stakeholders in retrofitting projects are public building owners, private building owners, the occupants, energy utility companies and other financing bodies, retrofit providers and governments. For a business model to work, each of these stakeholders’ interests must be considered, as well as addressing all the barriers that were listed in the section above.

There is a variety of financing models that have emerged over the past couple of years which go beyond traditional ESCOs which mainly related to public markets.

The tables below summarise the different types that are currently emerging as well as the ones that are more established. The models below are based on the situation in the US market. They give a good overview of the process of how the US is approaching retrofitting in their own market, where strong private sector involvement is envisioned. Each of the business models addresses a different size of retrofitting project.

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\(^8\) THINK – Topic 7 final report : How to Refurbish All Buildings by 2050, June 2012
The study, commissioned by the Rockefeller Foundation which has researched and prepared these tables, points out that the PACE model has a strong potential but requires involvement of the public sector through regulation as well acceptance by the building and mortgage industry.

They then identify the Energy Service Agreement business model as the one that has the most short term potential to achieve significant impact because when implemented correctly it can meet both the needs of real estate owners and financing bodies with minimal legislative intervention and public subsidies.

The other big market currently for energy retrofits is Europe.

The EURACE estimates that capital for Europe’s buildings renovation will come from just six sources: Government, Building Owner, Building Occupier, Bank, Renovation Contractor or Energy Supplier.

The amount of capital that is made available by each of these sources to renovate Europe’s buildings depends on three factors:

- the source’s access to and cost of funds
- its perception of the risk/ return
- characteristics of the renovation investment
- other competing investment priorities

Financing models in Europe are also diverse and there are currently three main approaches:

The first approach is to have the owner finance the renovation where the building owner is the actor that takes charge of the process of designing, implementing and financing the retrofitting.

The other model is the utility fixed repayment model, where the utility company is in charge to subsidise the up-front investment, with the cost being reimbursed through monthly payments that are fixed and not related to performance.

The third option followed is the energy performance model where the retrofit provider finances the project and gets repaid through the savings achieved. The EURIMA report also brings forth another business model option; the “aggregated investment model” where they identify key features such as “the creation of a standardised energy efficiency asset, multi channel origination, on-bill repayment and the potential for securisation with (or without) government credit enhancement.”

It has also been reported that overall the market for energy efficient building retrofitting is shifting away from one-time retrofits to models where upgrades are continuous and the use of ICT and real-time monitoring enables these projects to be implemented in a smarter way, thus successfully reaching the expected (simulated) cost savings and emission reductions.

Overall retrofitting will play a crucial role in allowing Member States in Europe to achieve their goals in terms of energy efficiency targets. The financing models for these projects thus become crucial in order to allow the deployment of retrofitting practices and technologies effectively and at a good pace in the European market.

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<th>Definition</th>
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**Figure 6 Business Model Definitions**