THE PRINCE OF WALES'S
CORPORATE LEADERS GROUP

Business conversation

Renovation Roadmap:

Making Europe's homes fit for the 21st century

UNIVERSITY OF CAMBRIDGE
INSTITUTE FOR SUSTAINABILITY LEADERSHIP

WE MEAN BUSINESS

The Prince of Wales's Corporate Leaders Group

The Prince of Wales's Corporate Leaders Group (CLG) brings together executives from a cross-section of European industry to accelerate progress towards a low carbon, sustainable economy. Through cross-fertilisation of ideas and influential conversations with policymakers and peers, the CLG advocates forward-looking solutions that build a resilient and prosperous future. The CLG is convened by the University of Cambridge Institute for Sustainability Leadership (CISL).

The CLG is a founding member of the We Mean Business coalition.

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Executive summary

Renovating Europe's building stock to make it more energy efficient offers a huge opportunity to generate jobs, reduce energy use and dramatically reduce emissions in line with the Paris Agreement. However, current policy is not delivering change at the rate necessary, and the investment climate for business is too uncertain. Mandatory regulation is required to increase the rate of building renovation and meet the needs of the 21st century.

Buildings are responsible for 40 per cent of energy consumption and 36 per cent of CO_2 emissions in the EU. Roughly 97 per cent of the EU's building stock – over 30 billion m^2 – is not currently energy efficient and at least three quarters of it will still be in use in 2050.[1] Homes are the main type of building in all Member States. New buildings are able to take advantage of modern materials and knowledge to achieve enhanced energy efficiency. But most buildings are domestic and most are not new. Tackling energy efficiency in housing has been an intractable problem but this is where the change needs to happen. For this reason, this report focuses on the opportunities provided by tackling the renovation of existing residential buildings to make them more energy efficient and more comfortable and to save their residents money.

According to the International Energy Agency, the highest untapped low-cost energy efficiency potential in Europe is in the building sector. However, unless there is significant policy change, up to two thirds of that potential will not be realised.[2]

The primary aim of the Paris Agreement is to keep a global temperature rise this century well below 2°C above pre-industrial levels.

The International Energy Agency has also called energy efficiency the 'first fuel', and in order to reduce both overall EU energy demand and imports and also meet Paris Agreement objectives, around 250 million homes across the EU will need energy renovation, alongside other measures. That's almost 23,000 homes a day until 2050. This implies a future annual home renovation rate of 3.4 per cent per year – more than double the current European average.

Most Member States have been trying to encourage voluntary renovation, and although this approach has led to some improvements, it is not enough to double the renovation rate.

To meet climate change targets, the rate of building energy renovation needs to more than double. Member State governments should **legislate for the renovation of buildings at key trigger points, and to a minimum performance standard**. This should be in the context of **robust, long-term national renovation strategies** that provide certainty for investment by business and property owners. Member State governments should also be **providing guarantee funds to bring down the cost of green finance** for renovations. Renovations need to be carried out by **skilled and accredited tradespeople** who can co-ordinate complex projects and **meet high-quality standards**. And property owners need **independent advice and support**, so that renovations are financed and renovated buildings are fit for the future.

The opportunities are clear – not just to reduce emissions but to create jobs, enhance skills and make the most of the new technologies available and improve the wellbeing of European citizens. The leading businesses in this report back a more ambitious approach by governments, grounded in the right regulation, including mandating action, which will remove the barriers to increasing energy efficiency and allow Europe to reap the significant benefits available.

This report is based on interviews with 12 companies that are members of The Prince of Wales's Corporate Leaders Group and its close network. They are involved in the energy efficiency renovation of buildings (mostly by providing materials and equipment). They are committed to doing their bit to increase the energy efficiency of Europe's building stock but they need all European governments (including the UK at the time of writing) to provide the framework for them to make the necessary investments.

We would like to thank the following people and companies for their time and contributions:

3M	Natasa Sbrizaj, Manager, Public Policy & Government Affairs, Europe
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Introduction

Buildings are responsible for 40 per cent of energy consumption and 36 per cent of CO_2 emissions in the EU. They are the homes, workplaces, schools, hospitals and community centres of Europe, which need to be heated/cooled and powered each day. The quality of these buildings directly affects the physical and mental health of their occupants. It is estimated that 11 per cent of Europe's population experiences energy poverty as a direct consequence of poor building quality, especially thermal efficiency.

In the context of targets adopted under the Paris Agreement, it is widely recognised that the rate of building renovation needs to increase significantly. While this presents many challenges, it also presents significant opportunities to create jobs and improve the skills of the workforce in Europe. But in order to realise these opportunities, the EU needs to do more to ensure that its long-term policy regime is up to the challenge.

Buildings have been the subject of an ever-expanding policy regime. The Energy Performance of Buildings Directive (2010/31/EU) is the key regulatory driver for energy efficiency and on-site renewable energy generation in homes and non-domestic buildings, establishing improvements to new build standards and seeking to increase the rate and quality of renovation. This is supported through requirements in the Energy Efficiency Directive (2012/27/EU) and other regulations, as well as a range of EU-funded projects that seek to overcome the many barriers to building renovation, including technology, behaviour, supply chain and financing.

The responsibility for implementing these Directives falls to Member States, which have the opportunity to put in place legislation and funding to stimulate building renovation in their countries. Additionally, they have the responsibility to improve the energy performance of many of their own public buildings.

Innovations by business and industry are changing the nature of how buildings are designed, managed and operated, providing greater automation and focusing on comfort and control. In addition, the growth of electric vehicles and storage technologies are changing the role of buildings in places – they are increasingly part of an interconnected energy system at a local level, which use, generate and store electricity. These technical innovations, along with those in programme delivery, finance, supply chain and behaviour, are important to highlight, in order to move the policy agenda forward at both EU and Member State level.

This business briefing is part of a series published by The Prince of Wales's Corporate Leaders Group, with the aim of stimulating policy debate and leading positive change among politicians, policymakers and businesses, who all have an important role to play in the large-scale improvement required in buildings. It is based on interviews with 12 companies that are members of the Group and its close network, and that are also involved in the energy efficiency renovation of buildings (mostly by providing materials and equipment), including its promotion through international forums.[3]

Buildings are responsible for

40% of EU energy consumption

&

36% of EU CO_2 emissions

Renovated social housing development, Wilmcote House, UK. Copyright ECD Architects

Section 1

Why is building renovation important?

Roughly 97 per cent of the EU's building stock, amounting to a floor area of over 30 billion m², is not energy efficient and 75–85 per cent of it will still be in use in 2050.[4] To meet Europe's climate and energy targets, around 250 million homes across the EU will need energy renovation.

This means that almost **23,000 homes** need to be renovated **every day** until the year 2050. This equates to a future annual home renovation rate of 3.4 per cent per year, which is more than double the current renovation rate. This is equivalent to renovating more than all of the homes in Paris, London and Berlin every year. The depth of those renovations will vary, but given that the vast majority of homes are towards the lower end of the energy performance scale (in energy performance certificate classes C–G), many of them will require deep renovation.

> "The vast majority of buildings in Europe are towards the lower end of the energy performance scale. The renovation challenge for business is significant and we need policy and regulation that drives and supports our action."
>
> *Harry Verhaar, Head of Global Public & Government Affairs,* ***Philips Lighting***

> "Transforming building energy renovation needs to be a partnership. Companies cannot deliver the needed transformation without government leadership but also governments cannot deliver the transformation needed without companies investing and working in the same direction."
>
> *Susanne Dyrbøl, Director, Group Public Affairs,* ***ROCKWOOL Group***

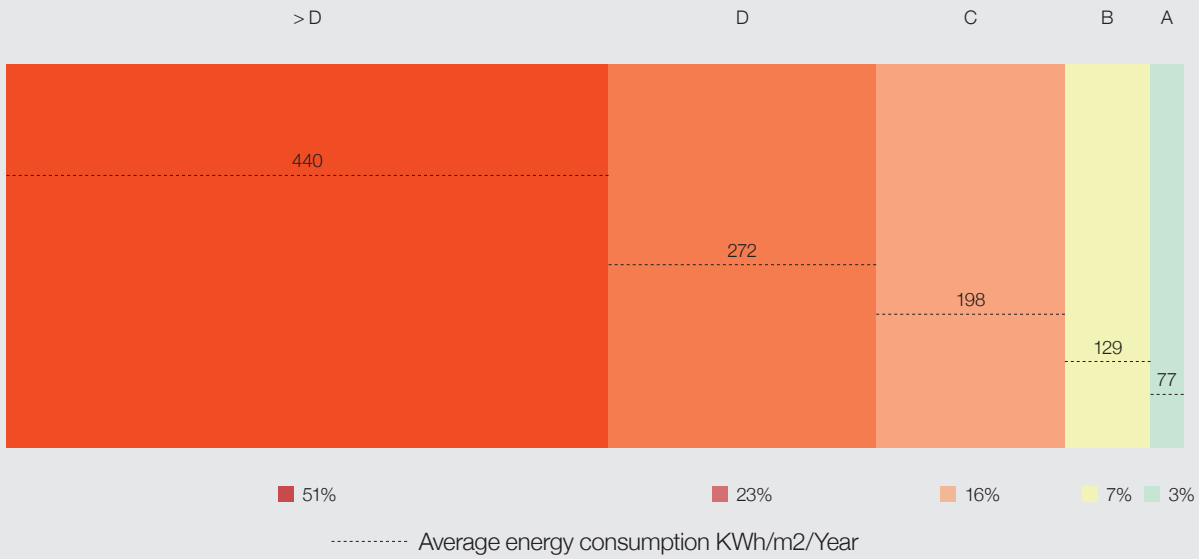

Figure 1: EU building stock categorised by energy performance band (EPC label A-G) (source: Buildings Performance Institute Europe, BPIE)

Energy efficiency renovation also presents a **significant opportunity for economic development and job creation**. In 2011 (last Eurostat data available), the building sector accounted for seven per cent of the EU GDP and almost nine per cent of the total industry employment:

- Specialised construction activities that include renovation work and energy renovation contributed 66 per cent of the value added of the building sector and 68 per cent of its employment.
- Enterprises with fewer than 50 employees generated 72 per cent of the sector's value added, while those with over 250 generated 14 per cent.
- Enterprises with fewer than 50 employees contributed 79 per cent of jobs in the sector.
- Specialised construction activities that include renovation work and energy renovation employed three times more people than the activities supplying energy to buildings for the same value added.[5]

To meet Europe's climate and energy targets, around **250 million homes** across the EU will need energy renovation. This means that almost **23,000 homes need to be renovated every day until the year 2050**.

250,000,000

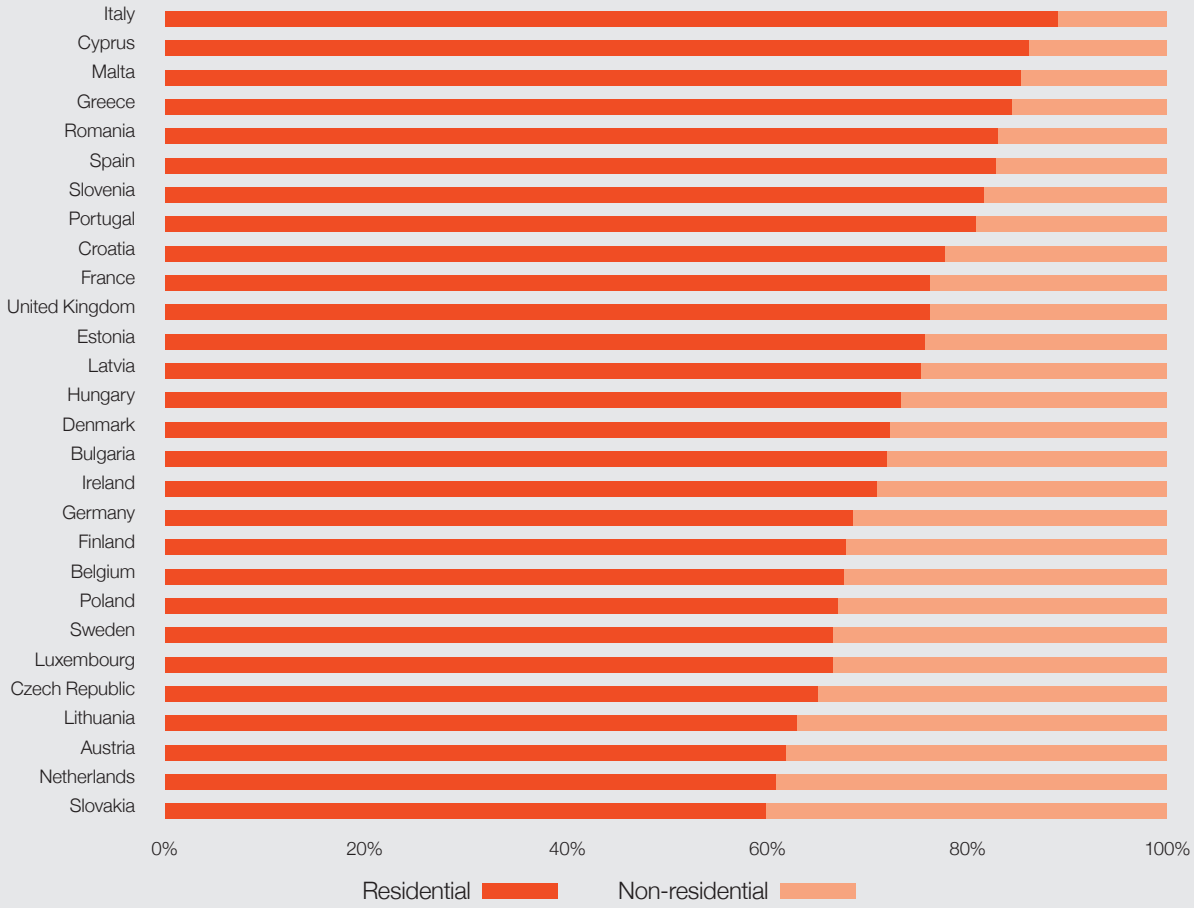

Figure 2: Breakdown of building floor area in EU Member States (source: European Commission, 2016).

The International Energy Agency has produced policy scenarios that investigate the potential for energy savings in different sectors of the economy.[6] Its work highlights two relevant points: firstly, that the highest untapped energy efficiency economic potential of any sector is in the building sector; and secondly, that unless there is significant policy change, up to two thirds of that potential will remain untapped. Analysis by the European Commission's Joint Research Centre[7] has shown that the most cost-effective energy renovation potential is in buildings located in countries that have joined the EU since 2004.

Data show that space heating is the main end use of energy in homes in Europe, accounting for 64.7 per cent of the average EU household energy use, followed by 13.9 per cent for water heating, 13.8 per cent for lighting and appliances, 5.7 per cent for cooking, 1.5 per cent for 'other' and just 0.5 per cent for space cooling. And when looked at according to floor area, homes, rather than non-residential buildings, are the main type of building in all EU Member States.

Installation of external façade insulation.
Copyright ROCKWOOL Group

As an EU average, almost 70 per cent of homes are owner-occupied, and the remainder are in the rental sector (private, social or subsidised or free rent); significant variation occurs between Member States. About 40 per cent of Europe's homes are in multi-apartment buildings and are generally energy inefficient.

Although the proportion varies, this predominance means that this report, while covering all types of buildings, focuses primarily on overcoming the many barriers to the home renovation challenge.

> Building renovation is an excellent opportunity to introduce energy efficient and low carbon technologies, as heat pumps or solar energy, bringing renewable energy into the building sector and reducing drastically CO_2 emissions.
>
> *Ángel Landa Ugarte, Senior Analyst, Energy Prospective,* ***Iberdrola***

Section 2

What is the current status of building renovation in Europe?

The EU sets the policy agenda, targets and minimum requirements for building renovation policy, which are then transposed by the Member States. The Energy Performance of Buildings Directive (2010/31/EU) is the key regulatory driver for energy efficiency and on-site renewable energy generation in homes and non-domestic buildings, establishing improvements to new build standards and seeking to increase the rate and quality of renovation.

Following the Paris Agreement in 2015, the European Commission launched the Clean Energy for All Europeans package,[8] which includes legislative proposals covering energy efficiency, renewable energy, the design of the electricity market, security of electricity supply and governance rules for the Energy Union.

> "This watering down of energy efficiency ambitions is taking us in the wrong direction. We need to do more, not less. We need to double our energy efficiency renovation rate if we are going to have a chance of delivering on the Paris Agreement."
>
> *Harry Verhaar, Head of Global Public & Government Affairs,* ***Philips Lighting***

While the policy process to enact the package is almost complete, there has been criticism of the level of ambition for energy efficiency improvements, which will not meet Paris Agreement obligations.[9]

While there are many barriers in building renovation, the **lack of demand** to more than double the renovation rate, along with finance, is one of the key hurdles. The fundamental causes are:

- lack of knowledge or awareness of energy efficiency and its benefits
- lack of incentives, or overly complicated incentives, for energy efficiency improvements
- no obligation or regulation to renovate
- upfront costs and/or payback period are too high, discouraging property owners
- complex ownership and governance arrangements make improvements to apartment buildings challenging and the decision-making process is protracted, with no guarantee of securing approval.

Business wants a long-term direction of travel for regulations – we need to know the direction and future level of requirements to prioritise investment in new innovative solutions and business models. This will provide a strong foundation for business to invest and grow.

Susanne Dyrbøl, Director, Group Public Affairs, ***ROCKWOOL Group***

We need a balanced approach of stimulating and regulating renovation. We need to regulate enablers, like at the point of sale and rental of homes, to increase energy efficiency.

Harry Verhaar, Head of Global Public & Government Affairs, ***Philips Lighting***

Iberdrola is committed to help its customers live more comfortable lives and reduce their carbon footprint, by offering them smart technologies to reduce their energy use and clean electricity from renewable sources. To speed this up, Iberdrola believes building regulations can help drive energy efficiency and carbon footprint improvements in buildings, and climate policies can also help accelerate a wide range of energy efficiency solutions offered.

Miguel Muñoz Rodriguez, Senior Energy Policy Analyst, Chairman Area, ***Iberdrola***

Cities are trusted, closer to citizens, and knowledgeable about what is happening in their area. I'd like to see them taking a leading role in promoting energy efficiency renovation, the benefits and support available.

Natasa Sbrizaj, Manager, Public Policy & Government Affairs, Europe, ***3M***

Regulation

Energy efficiency renovation is unlikely to reach the necessary scale without some level of compulsion. Most Member States have been trying to encourage voluntary renovation through awareness campaigns, fiscal incentives and financial penalties, and while this approach has arguably resulted in improvements, most companies interviewed did not think this was sufficient.

Regulation is supported by many of the businesses interviewed, particularly at key trigger points, such as the sale and rental of properties, and when major renovation works are undertaken. In addition, businesses are keen to see minimum energy performance standards (MEPS) introduced, to ensure the continual improvement of building stock, starting with the most energy inefficient properties.

The existence of a clear roadmap for the expected minimum energy performance of buildings, which improved over time through to 2050, would provide a transparent, low-risk market in which businesses could invest. It would also bring down the risk for energy efficiency finance, reducing interest rates for building owners.

As well as regulatory intervention from national governments, businesses were also keen to see cities and municipalities playing a greater role in promoting energy efficiency to property owners. Cities are seen as key players in energy efficiency; they are often leading innovation and best practice, and are well placed to communicate with their citizens.

Finance

The high upfront capital costs and long payback periods for deep energy renovation in homes present a significant barrier to improving building energy efficiency. Because of the complex nature of the building renovation market and the inherent conservatism of the finance sector, it has taken time to reach a solution, predominantly as a result of intervention at both the European and Member State level.

The availability of low-cost finance is seen as one of the primary means of unblocking energy efficiency renovation. Home renovation costs, which have been paid for from savings or personal consumer credit, instead can be linked to energy utilities or home service companies (for example for heating system replacement and servicing agreements). Lenders have not traditionally favoured the small size and diverse nature of energy efficiency improvement projects, for homes or the non-domestic buildings sector, but are increasingly starting to offer mortgage extensions and green mortgages, in some cases with reduced interest rates to cover the significant costs of deeper renovation.

Aggregation by energy service companies is one potential solution, as is the use of guarantee funds to reduce the risk to lenders and thereby lower the cost of finance to building owners or occupiers. European structural funds and European Investment Bank lending are being used to increase the scale of building renovation by reducing the financial risks to banks and other lenders.

Programmes such as **Lloyds Bank Commercial Real Estate's Green Lending Initiative**, **KfW** and **KredEx** are applying green criteria and lowering the cost of borrowing for building renovation.

Walls and windows renovation. Copyright EDF-G ENGEL

The renovation journey

Not everyone can afford a deep retrofit or renovation of their building, so it can be helpful to take a longer-term view of the building. A building passport, which sets out the specific solutions tailored to a building, allows building owners to stage their renovations over time. Initiatives such as **Passeport Efficacité Énergétique (P2E)** and **Woningpas EPC+** are leading the way on this new approach.

Many of the businesses interviewed, particularly those whose materials are used in building renovations, also support taking a longer-term view so that the products and materials installed as part of the energy efficiency renovation process do not increase the carbon footprint of the building through the use of carbon-intensive materials or products, increase toxicity (emitted by chemicals used in products) or add to the waste stream when the building is renovated again in the future. We will prepare a follow-up briefing on this topic.

> "It would be great if a digital record were kept, so that people know the kind of materials buildings are made of and how to dismantle them. As there are currently so many 'unknowns' in buildings, such transparency would make renovation a lot easier, and help to drive innovation in the market to use safer, healthier, non-toxic materials."
>
> *Lukas Hoex, Marketing Manager,* ***DSM-Niaga***

There have been many policy challenges in trying to unlock the potential of residential energy efficiency. It is important to learn from the many well-intentioned missteps of previous attempts to increase energy efficiency in homes. In the **UK**, the **Green Deal** (2013) was designed to address the full renovation journey, with a particular focus on installer accreditation and pay-as-you-save on-bill finance.

The programme failed to achieve uptake for several reasons, including:

- It was a complicated process, which the homeowner had to navigate by themselves.
- The interest rate for the finance was between seven and nine per cent per annum, which although fixed was not well received when mortgage rates were hovering around four per cent per annum.
- The finance was limited by the 'golden rule', which was designed to protect customers so that their repayments would not exceed the financial value of their energy savings. However, with interest included and low estimates of energy savings, the only measures that could be funded were a combination of a new gas boiler, loft insulation and cavity wall insulation.
- For all of the above reasons, commercial partners were sceptical of the scheme, which failed to gain support.

Despite the overall concept being well intentioned, the design and implementation phases did not adequately address the many concerns raised by stakeholders nor were lessons learned from previous schemes.

Skills and training

Another challenge identified by businesses is the multiple trades and skills needed to renovate a property. The renovation industry, as distinct from manufacturers of construction materials and building technologies, largely comprises locally based, small and micro-businesses, especially in the residential renovation sector. Unlike larger construction firms, which have a range of skills and trades to cover all the needs of a large renovation project, these smaller firms may deal with only one element of a small project; they are also often trained by a product manufacturer and are therefore only able to recommend and install specific brands.

When builders are providing quotes for home improvements, they should have the skills to provide energy efficiency advice and suggestions to homeowners. For example, wall insulation could be installed at the same time as a kitchen or bathroom is being installed, offering homeowners the opportunity to make energy efficiency improvements at a marginal cost. Similarly, builders should be recommending energy- and water-efficient appliances and fittings as part of the wider renovation.

Smaller property owners often have to act as project manager for their renovation works, and are often not equipped to do so. The alternative is a professional project manager, which adds additional costs to the renovation.

Accreditation and labelling schemes can be an effective way of ensuring tradespeople are trained in the safe and proper implementation of these projects, as they incorporate training, standards and a visible means of identifying tradespeople who are competent. Under the EU Renewable Energy Directive (2009/28/EC), installers of small-scale renewable energy systems must be trained and certified. Similarly, guarantee schemes are run for registered insulation installers, which provide confidence and recourse for homeowners.

Employment in the energy renovation market will **boost the EU economy** and presents many opportunities at the local and Member State level.

Why will employment in the energy renovation market boost the EU economy?

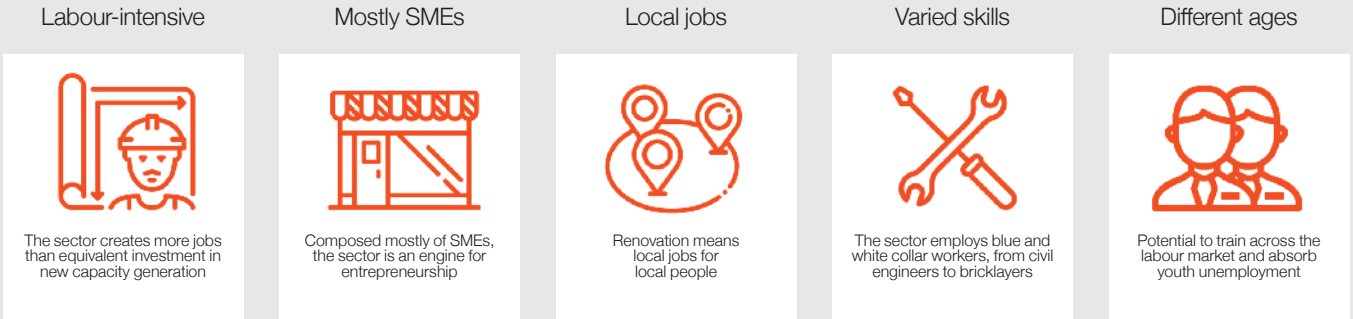

Figure 3: the economic benefits of boosting the energy renovation sector (source: Renovate Europe and European Builders Confederation[10])

Figure 4: the FEEBat process outline (2014-2017) (source: Chantal Degand, EDF)
*The ratio has evolved over the period, from 60% to 40% of the bill being refunded by EDF.

> Collaboration between owners, contractors, designers and suppliers will help build the knowledge base and help the selection of material and technical solutions necessary for the often challenging renovation projects.
>
> *Anna-Liisa Myllynen, Senior Vice President, Head of Sustainability,* ***Stora Enso Wood Products***

To realise these benefits, however, much work needs to be done not only to attract skills to the sector, but also to upskill those who are already working in building renovation. A doubling of the renovation rate will require a larger, more skilled workforce to undertake each step of the renovation journey. Given the range and scale of new products and new techniques that are coming onto the market, there is a strong case for more **formalised continuing professional development** for the construction and renovation industry.

Governments have helped to develop and deliver building renovation training programmes for builders, such as the French **FEEBat** scheme, of which **EDF** is a partner. EDF delivers specific training on 15 elements of energy-efficient building renovation, across 150 training centres with a FEEBat agreement. The programme benefits from a financial contribution from EDF of up to €50 million over four years via the Certificats d'Economies d'Energie, the French white certificates scheme.

Energy poverty

Energy or fuel poverty is increasingly recognised as a significant problem across Europe. It is estimated that approximately 11 per cent of Europe's population live in energy poverty. There is no officially agreed EU definition of energy poverty, but it is generally considered to be when a household needs to spend more than ten per cent of its income on energy (ie heating, hot water, cooking and lighting). Energy poverty is caused by three main factors: low incomes, high energy prices and poor home energy efficiency.

> EDF's experience through our 'solidarity DIY workshops' is that people (and fuel poor people) need help to understand how to renovate, and how to better use energy.
>
> *Chantal Degand, Deputy Head of Department, Supply Division,* ***EDF***

The most sustainable, long-term solution to energy poverty is to significantly improve the energy efficiency of homes so that they can be heated, and increasingly cooled, affordably. However, households in energy poverty require different policy and financial support. It is important that any policies, penalties or fiscal measures introduced to improve energy efficiency renovation do not increase energy poverty, either by bringing more people into energy poverty or by making energy poverty more extreme for those already experiencing it.

Water efficiency

Hot water use is a significant part of household energy use, and increased water efficiency can help to reduce usage. However, water efficiency renovation faces many of the same challenges and solutions as energy efficiency renovation. Awareness and demand for water efficiency renovation and products is low. There is no mandatory labelling of water use or performance on appliances or products. The worst-performing products are not being regulated out of the market. Water efficiency renovation requirements should be mandated in building codes.

> You can't look at energy without looking at water. If we run out of water, the solutions, such as desalination, consume a lot of energy. Reducing the amount we use in homes is a much better option.
>
> *Jean Spencer, Director of Strategic Growth and Resilience,* ***Anglian Water***

Anglian Water has implemented its own in-home water efficiency advice programme, **Bits and Bobs**, in the **East of England**. An approved plumber, who has been through specific water efficiency renovation training, visits customers and provides advice on how they can reduce their water use. They install low-flow shower heads, tap aerators and cistern displacement devices. On average, customers reduce their water use by 50 litres per household per day, the average household consumption being 133 litres per day.[11] Behaviour change is the biggest driver in reducing demand. Combining the financial savings from both increased energy and water efficiency helps to increase awareness of the relationship between energy and water use in households.

It is estimated that approximately

11% of Europe's population live in energy poverty.

Section 3

Case studies

Co-ordinating support at all stages of renovation

The building renovation landscape is a complex one, with a multitude of actors and limited regulation. This complexity is a key barrier to building energy efficiency renovation, and so one of the main areas of best practice has been the co-ordination of expertise to offer a simplified service to the end user.

Picardie Pass Rénovation in **France** offers an end-to-end service to homeowners in the Picardie region, led by the regional government. Householders must achieve at least 40 per cent energy savings as a result of works. The project aims to reach 2,000 homes. Both financial and technical advice are offered at all stages of the renovation process, including follow-up for five years after works are completed in order to manage rebound effects and minimise technical risks. As of February 2018, **Picardie Pass Rénovation** has:

- dealt with 5,593 contacts
- undertaken 2,560 thermal audits
- planned 1,488 renovations, including ten condominiums representing 1,074 apartments
- committed €35 million of works.[12]

In **Denmark**, the **BetterHome** project, launched in 2014, is aimed at driving the uptake of energy efficiency through a co-ordinated offer to homeowners. It trains and guides installers on how to approach homeowners, from the first contact to the finalisation of the process. The project is seeking to engage a network of 3,500 installers (from 105 organisations), five banks and mortgage providers and four utilities. The project is mainly concerned with deep renovation, and realised investments of about €70,000 and energy savings of approximately 30–70 per cent.

ROCKWOOL is a partner in the project, restructuring supply-side services to homeowners and helping them to overcome their concerns about embarking on a renovation project. BetterHome became profitable after just three years, with 200 projects in 2016, and continued growth is expected. They report that **for every €1 million invested in upgrading building stock in the EU, 19 new direct jobs can be created in the construction sector**.[13]

Taking the long-term view of renovation possibilities

Building occupiers may opt to undertake renovation in a step-by-step approach rather than all at once. New tools and techniques are being developed that provide a longer-term view on the routes to a more efficient building.

Several examples of building passports have recently been piloted. In **France**, **EDF** is a partner in the **P2E**, which is encouraging householders to begin a systematic step-by-step journey to renovate their homes. The passports store information on improvement measures already undertaken, any works currently under way and those works planned or intended for the future. The passport is stored as an online tool and can act as an archive, training tool and a guide to future works. In this way, different services or tradespeople can extract information that is useful to them and can co-ordinate on any works undertaken on the home.

In this way, action on easier-to-undertake and typically less-disruptive improvement measures, such as energy efficient lighting whose savings potential in European homes is estimated at €27 billion[14], could form part of a longer renovation pathway.

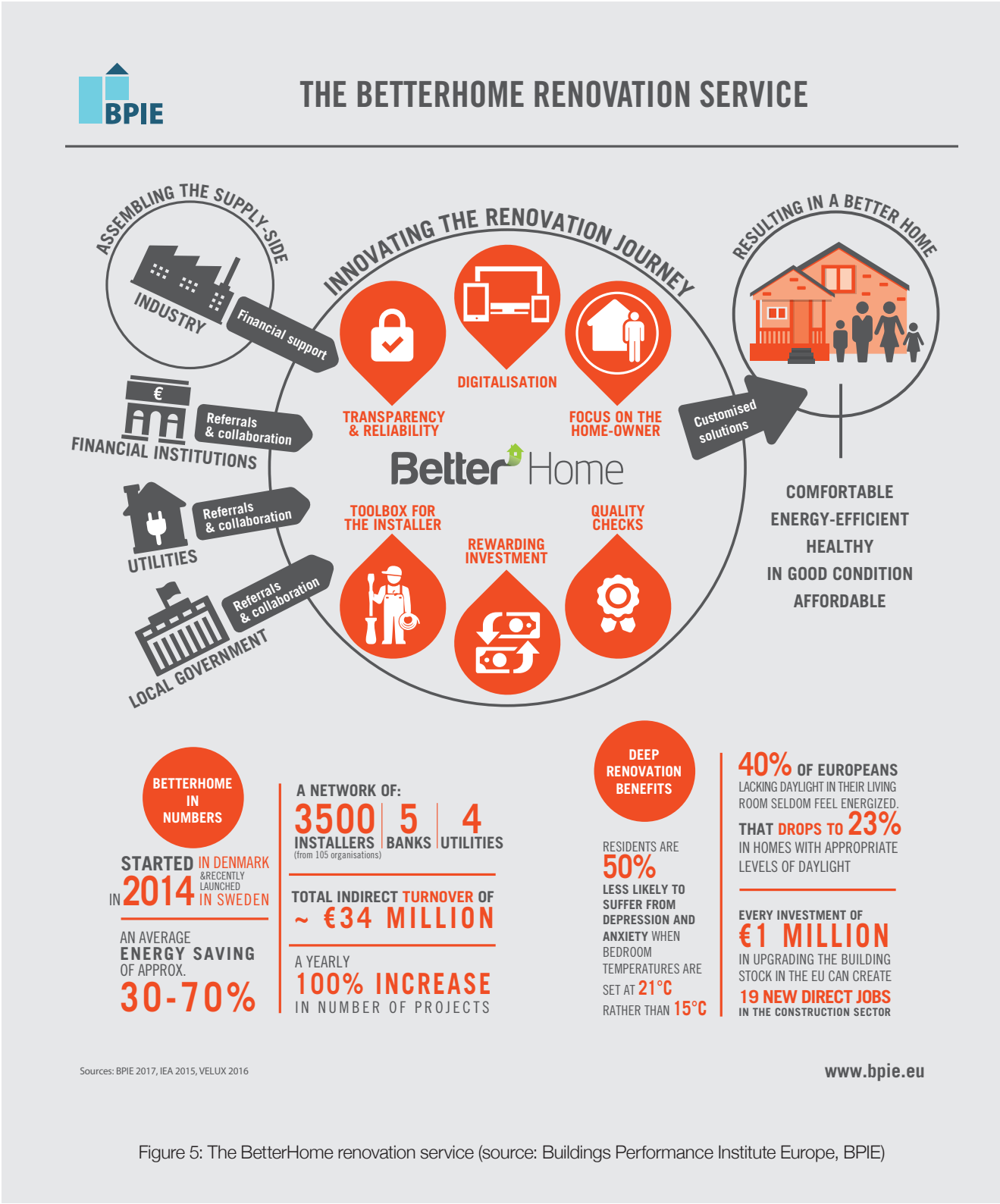

Figure 5: The BetterHome renovation service (source: Buildings Performance Institute Europe, BPIE)

Improving financial offers innovation in business models

The green mortgage market is of growing significance and interest. Work by the European Mortgage Federation[15] and others is investigating by how much energy renovation may increase property values; it is also looking into whether green loans or borrowers present lower levels of risk, as they may have increased disposable income as a result of decreased energy expenditure.

> For housing, a huge driver will be low interest mortgage rates based on improving the energy efficiency of the home during the total renovation. Banks can really drive it.
>
> *Jonna Byskata, Director, Building Systems, Government Relations Europe,* ***United Technologies***

This information, by changing the risk assessment for institutional investors, may make it more attractive to increase lending and/or lower interest rates for more ambitious levels of home and commercial building renovation.

Some leading financial institutions are increasingly focusing on green lending as part of their portfolios. **Lloyds Bank Commercial Real Estate** has a **Green Lending Initiative**, which has supported significant projects in the UK, encouraging sustainable improvements.

Other approaches to overcoming financial barriers to renovation have included **Pay as You Save**, whereby the cost of improvement measures is recouped through ongoing saving on energy bills and on-bill or on-tax finance. The successful **PACE model** (Property Assessed Clean Energy) has funded over 175,000 home upgrades in the USA and is a $4.3 billion market.[16] It has also been used to finance 1,170 commercial building projects and is a $5.4 billion market. HERO and Renew Financial, which provide PACE loans, report that just over half of all vendors are able to transfer their PACE loans to the new homeowners.[17]

The **EuroPACE** project is just starting in 2018 and is seeking to transfer the model to Europe. Such approaches have the advantage of being associated with the building and not the person using it – so, if a building occupant moves, the new owner has the opportunity to take on the improved building, with lower running costs, as well as the ongoing financial repayment. This may prove unpopular in the some markets.

Energy Performance Contracting models have also been used on commercial buildings. Such models remove the need for upfront finance, as the cost of improvement measures is recouped through ongoing savings on the energy bill. These models are underpinned by performance guarantees, and include contractual agreements to reach agreed minimum performance standards or to recompense building owners if these standards are not met. The ability of public authorities to use such approaches was limited in part by their treatment in public accounting. In September 2017, the EU, through Eurostat, amended the way such renovation projects are accounted for,[18] and it is hoped that this change will open up new additional public building renovation opportunities.

The so-called split incentive problem has also been well researched – tenants in rental properties (both homes and commercial buildings) do not feel that they should pay for building improvements that result in long-term benefits to the landlord, and since landlords are not typically paying the energy bills for the property while it is let, they do not feel that they should improve the building to lower the energy spend for tenants. Several approaches such as banning the rental of poorly performing properties and providing subsidies through grant, loan or taxation support have been introduced to encourage landlords to take renovation action.

Other more novel approaches are also being taken to overcome financial barriers to renovation as well as delivering on other objectives. The EU-funded ABRACADABRA[19] project is focused on creating a substantial increase in the real estate value of existing buildings through significant energy and architectural transformation. This approach includes, for example, adding storeys, or top-ups, to buildings to increase building value/rental income, and using this added value to help offset the cost of deep renovation to the whole building. Such approaches can reduce payback times of the interventions, increasing the attractiveness of the existing building stock and help accelerate progress towards Nearly Zero Energy Buildings targets.

In **Estonia**, the **KredEx** revolving loan fund has combined loans, technical assistance and a rebate-type grant for multi-apartment buildings. At the completion of the first stage of the scheme, 619 apartment blocks, including over 22,000 apartments, throughout Estonia had become more energy efficient. KredEx aimed to achieve energy savings of 20–30 per cent; however, it now predicts 40 per cent. KredEx, a public financing institution, was the holding fund manager of the renovation scheme; it received €17.74 million of European Regional Development Fund (ERDF) funds and attracted funds from other public sources, providing a total of €72 million for the project. Two banks distributed the funds to homeowners' associations, which could rely on KredEx for technical assistance, as well as help with energy audit grants or guarantees covering their 15 per cent share of renovation costs. KredEx has now exhausted its initial fund, and is currently seeking additional funding to support further renovations, while also developing the revolving fund over the longer term.[20]

> We need to be looking at other innovative business models. Increasing the floor space, through building extensions and additional storeys, might be a model for funding building renovation while also increasing rental or sale income from the larger building.
>
> *Jari Suominen, Executive Vice President,* ***Stora Enso Wood Products***

Probably the most widely cited example in Europe of a large-scale home renovation programme is **Germany's KfW Energy-efficient Refurbishment programme**. This provides funds in the form of either a grant or a loan to anyone investing in the energy efficiency refurbishment of an older residential building or the construction or initial purchase of a new or newly refurbished KfW-efficient home. As of 2016, the programme had funded improvement work in 448,000 homes, representing €50 billion of investment and saving more than 8.8 million tonnes of CO2 per year. The programme works through intermediary banks, and so has a wide reach and offers higher incentives for higher levels of renovation. Interest rates for the loans covering the cost of improvements are kept low (close to one per cent) and the scheme is well promoted and understood by householders

Reducing disruption

One of the challenges for building renovation is the time taken to undertake the project and the disruption to occupants. In deep home renovation, residents may need to find alternative accommodation for more than a month. For businesses, it may result in temporary closure.

The **Energiesprong** system is making use of off-site construction and prefabricated facades to minimise disruption to occupants. Each deep refurbishment is completed within a week without the occupants needing to move out. The cost is covered in the long term through savings on the energy bill, the level of which is covered by a performance guarantee.[21] In the Netherlands, 1,300 of these nearly zero-energy renovations have been undertaken, and a further 500 are being built.[22]

Section 4

Conclusion and recommendations

These recommendations are focused on the national and local level, where there is an opportunity to take forward the building renovation agenda and realise the many benefits regardless of the European-level decisions.

To meet climate change targets, building energy renovation needs to achieve its potential. Member State governments should **legislate for the renovation of buildings at key trigger points, and to a minimum performance standard** backed by enforcement. This should be in the context of **robust, long-term national renovation strategies** that provide certainty for investment by business and property owners. Member State governments should also be **providing guarantee funds to bring down the cost of green finance** for renovations. Renovations need **skilled, accredited tradespeople** who can co-ordinate complex projects and **meet high-quality standards**. And property owners need **independent advice and support**, so that renovations are financed and renovated buildings are fit for the future.

Mandating energy efficiency

The single biggest action Member State governments should take is to **introduce regulation to compel the renovation of buildings**. Regulation should cover both so-called **trigger points** and **minimum energy performance standards**. When a building is being rented, sold, upgraded or extended, it should be required to meet a minimum standard of energy performance. Similar regulations are being implemented in the Netherlands and the UK, but these should be expanded to all trigger points and introduced by all Member States.

This would ensure that the energy efficiency of buildings continued to improve at an increasing scale and pace, and would provide clear points that building renovation support programmes could target. It would also provide a clear, long-term platform on which businesses can base their investments. For many buildings, there will only be one or two opportunities to renovate between now and 2050; these should be seized.

Governments should also consider how internal interactions between different agencies and institutions with links to built environment sectors could be strengthened, and how they may interact more effectively with the business community, so as to create an 'enabling environment' for change across these sectors, and one in which the private sector is incentivised to act in the absence of regulation.

Robust renovation strategies

EU Member States are also required to develop **National Renovation Strategies**, the next iterations of which are due by 2020. They are designed to provide a strong and safe foundation for business investment in building renovation. The strength of these strategies has been criticised, and they need to be more robust and ambitious to achieve building renovation at scale, and to put the EU on track to meet its Paris Agreement commitments.[23] Member States should also include ambitious renovation programmes for public buildings, to act as an example. Additionally, a comprehensive buildings policy will require greater focus on **enforcement** of the building codes and minimum requirements.

'Deep retrofit' project to tackle poor insulation and energy poverty in social housing, Wilmcote House, Portsmouth, UK. Copyright ROCKWOOL Group

Providing government guarantee funds

Member State governments also have a key role to play in bringing down the cost of finance for building renovation, especially through the provision of guarantee funds to reduce the risk for private financiers, particularly banks, who can offer green mortgages to property owners. Fiscal incentives also drive renovation. The planned Financial Platforms that are being developed as part of the EU Smart Finance for Smart Buildings initiative will provide a useful service for stakeholders in co-ordinating tools and activities.[24]

Developing skills

There is also an important role for Member States to work with businesses and local authorities to develop **skills and training programmes for building renovation**, improving the quality of deep renovation, and linking new digital skills and the energy transition.

> Using government funds to guarantee private finance of renovation projects, to bring down the cost to the property owner, is more effective than using those funds for short-term refurbishment subsidies.
>
> *Jonna Byskata, Director, Building Systems, Government Relations Europe,* ***United Technologies***

Accreditation

Member States, in transposing the Renewable Energy Directive, have implemented accreditation and labelling schemes for tradespeople who are installing small-scale renewable energy systems. A similar scheme should be implemented for energy-efficient building renovation tradespeople. A well-recognised **accreditation and recognised labelling** programme for the energy renovation sector, linked to a national skills and training programme, would improve the quality and safety of the sector, and would instil confidence in property owners.

Working with national governments and businesses, **local authorities have an integral role to play**. As this paper highlights, **local and regional governments have been working closely with businesses** to implement innovative, and much-needed co-ordinated, programmes to bridge the many gaps in the building renovation process.

> Energy efficiency, innovation and sustainability are essential aspects to improve the quality of building renovation. Together, businesses and governments should foster the implementation of innovative materials, new techniques and sustainable building certifications. For this purpose, training is essential.
>
> *Rocío Fernández Flores, Corporate Sustainability Engineer,* ***Acciona***

Providing independent advice

Local and regional building renovation co-ordination programmes would support the residential building renovation market, where homeowners are often not equipped to understand or undertake the process. **'One-stop shops' are needed** to deliver independent advice; they could **provide tailored technical and finance recommendations**, and also **co-ordinate the finance and tradespeople required to undertake the building renovation**. Such one-stop shops should also engage and train small builders, who are usually local micro-businesses, to improve their capacity to promote, recommend and deliver energy renovations.

Local authorities should also be encouraged to develop **innovative financial solutions** and maximise the use of structural funds for energy renovation. Local authorities should also be exploring the use of **fiscal incentives** to encourage deeper renovation. As highlighted in this paper, encouraging significant energy and architectural transformation in existing buildings, thus increasing their real estate value, is also a key way to overcome financial barriers to renovation.

Business should continue to work with national and local governments to implement a more ambitious policy and delivery landscape for building renovation. Businesses have been active participants in renovation sector partnerships and the development of innovative products and delivery methods. An ambitious regulatory framework, which drives demand for building renovation, and many more improved co-ordination and delivery programmes will provide business with the long-term investment security it needs to increase the scale of energy efficiency renovation across Europe.

> Municipalities should take a more proactive role in promotion and co-ordination.
>
> *Natasa Sbrizaj, Manager, Public Policy & Government Affairs, Europe,* ***3M***

Various residential housing types, Hyères, France

References

[1] BPIE – Buildings Performance Institute Europe. (2018, January). *The concept of the individual building renovation roadmap: An in-depth case study of four frontrunner projects*. Retrieved from: http://ibroad-project.eu/news/the-concept-of-the-individual-building-renovation-roadmap/

[2] International Energy Agency. (2014). *Capturing the multiple benefits of energy efficiency*. Retrieved from: http://www.iea.org/publications/freepublications/publication/Multiple_Benefits_of_Energy_Efficiency.pdf

[3] For instance, a few Corporate Leaders Group member companies have signed the *Manifesto for Energy Efficiency in Buildings* in October 2014, which aims to mobilise business, governments and local authorities to improve the energy performance of their buildings: https://www.wbcsd.org/Projects/Energy-Efficiency-in-Buildings/Resources/Manifesto-for-EEB

[4] BPIE – Buildings Performance Institute Europe. (2018, January). *The Concept of the Individual Building Renovation Roadmap: An in-depth case study of four frontrunner projects*. Retrieved from: http://ibroad-project.eu/news/the-concept-of-the-individual-building-renovation-roadmap/

[5] European Commission, Joint Research Centre, Institute for Energy and Transport. (2015). *Energy renovation: the trump card for the new start for Europe*. Retrieved from: https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/energy-renovation-trump-card-new-start-europe

[6] International Energy Agency. (2014). *Capturing the Multiple Benefits of Energy Efficiency*. Retrieved from: http://www.iea.org/publications/freepublications/publication/Multiple_Benefits_of_Energy_Efficiency.pdf

[7] European Commission, Joint Research Centre, Institute for Energy and Transport. (2015). *Energy Renovation: The Trump Card for the New Start for Europe*. Retrieved from: https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/energy-renovation-trump-card-new-start-europe

[8] *Clean Energy for All Europeans*. (2016). Retrieved March 28, 2018, from the European Commission website: https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union/clean-energy-all-europeans

[9] Ecofys. (2016, April). *Higher EU energy efficiency and renewable energy targets enable greenhouse gas emissions reductions of more than 50% in 2030*. Retrieved from: https://www.ecofys.com/files/files/memo-higher-eu-energy-efficiency-and-renewable-energy-targets.pdf

Climate Action Tracker: EU. (2018). Retrieved March 28, 2018, from http://climateactiontracker.org/countries/EU

[10] Source: European Builders Confederation, Renovate Europe. http://www.ebc-construction.eu/fileadmin/Pictures/Publications_pictures/Infographics/2016/Energy_renovation_market_infographic.pdf

[11] The average consumption for households is 133 litres per day. The figure of 50 litres is an average based on the assumed savings per device fitted and includes 10 litres per household for behaviour change (Source: Anglian Water).

[12] *Picardie Pass Rénovation*. (2018). Retrieved March 5, 2018, from the Picardie Pass Rénovation project website: http://www.pass-renovation.picardie.fr/

[13] *Boosting renovation with an innovative service for home-owners. BetterHome: An industry-driven one-stop-shop solution, subject of the BPIE Innovation Briefing*. Retrieved March 16, March 2018 from the BPIE – Buildings Performance Institute Europe website: http://bpie.eu/publication/boosting-renovation-with-an-innovative-service-for-home-owners/

[14] Philips Lighting. (2016). *The LED lighting revolution: A Triple-Win for Climate, Economy and Society in the 21st Century*. Retrieved from: http://images.philips.com/is/content/PhilipsConsumer/PDFDownloads/Global/ODLI20170425_001-UPD-en_AA-PHL_LED-lighting-revolution-final.pdf

[15] *Energy Efficient Mortgages Action Plan (EeMAP)*. Retrieved March 8, 2018, from the EeMAP website: http://energyefficientmortgages.eu/

[16] *PACE Market Data*. Retrieved March 8, 2018, from the PACENation website: http://pacenation.us/pace-market-data/

[17] Halverstadt, L. (2015, June 22). Some homeowners looking to move must deal with a change of PACE. *Voice of San Diego*. Retrieved from https://www.voiceofsandiego.org/topics/science-environment/some-homeowners-looking-to-move-must-deal-with-a-change-of-pace/

[18] European Commission, Eurostat. (2017, September 19). *Eurostat guidance note. The recording of energy performance contracts in government accounts*. Retrieved from: http://ec.europa.eu/eurostat/documents/1015035/7959867/Eurostat-Guidance-Note-Recording-Energy-Perform-Contracts-Gov-Accounts.pdf/

[19] ABRACADABRA project website. Retrieved March 8, 2018: http://www.abracadabra-project.eu/project/

[20] *KredEx Revolving Fund for energy efficiency in apartment buildings*. Retrieved March 16, 2018, from the CITYnvest website: http://citynvest.eu/content/kredex-revolving-fund-energy-efficiency-apartment-buildings

[21] Energiesprong project website. Retrieved March 5, 2018: http://energiesprong.eu/

[22] *Energiesprong: The Netherlands*. Retrieved March 16, 2018, from the Energiesprong project website: http://energiesprong.eu/country/the-netherlands/

[23] BPIE – Buildings Performance Institute Europe. (2014, November). *Renovation strategies of selected EU countries. A status report on the compliance with Article 4 of the Energy Efficiency Directive*. Retrieved from: http://bpie.eu/publication/renovation-strategies-of-selected-eu-countries/

BPIE – Buildings Performance Institute Europe. (2016, September). *Building renovation strategies under the spotlight. Delivering the Energy Efficiency Directive Article 4 – Survey-based recommendations*. Retrieved from: http://bpie.eu/publication/survey-article-4-eed/

[24] *Smart finance for smart buildings: investing in energy efficiency in buildings*. (2018, February 7). Retrieved March 28, 2018, from the European Commission website: https://ec.europa.eu/info/news/smart-finance-smart-buildings-investing-energy-efficiency-buildings-2018-feb-07_en

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