Financing Energy Efficiency (EE) in Buildings

Background Paper

Input to the European Roundtable

Brussels, 16 November 2010

THE BUILDING PERFORMANCE INSTITUTE EUROPE - BPIE

The Building Performance Institute Europe (BPIE) is dedicated to improving the energy performance of buildings across Europe, and thereby helping to reduce CO_2 emissions from the energy used by buildings.

Its mission is to support the development of ambitious, yet pragmatic building-related policies and programmes at EU and Member State level and to drive their timely and efficient implementation by teaming up with relevant stakeholders from the policy and research community, the building industry and consumer bodies.

Created in 2010, BPI Europe is a not-for-profit organisation. www.bpie.eu

ACKNOWLEDGEMENTS

We would like to thank Silvia Zinetti, Energy Consultant, who helped in the drafting of this report.

We also would like to thank the following people for their input and feedback to the selected case studies:

David Adams, Knauf Insulation

Mirja Adler, KredEx

Peter Bach, Danish Energy Agency

Jan W. Bleyl-Androschin, Grazer Energieagentur

Stefano Carosio, D'Appolonia

Nicolas Dyevre, ADEME

Ralf Goldmann, European Investment Bank

Frank Lang, KfW Bankengruppe

Juho Puhakainen, European Investment Bank

Udo Schlopsnies, Berliner Energieagentur

Andreas Tuerk, JOANNEUM RESEARCH

Giampaolo Valentini, ENEA

CONTENTS

EXECUTIVE SUMMARY

Buildings account for 40% of total energy consumption in the European Union[1], with more than half from the residential sector. While only some new buildings benefit from model energy performance, the greater part of the saving potential has to be realised in the vast building stock already in existence.

The need to improve energy efficiency in buildings is now greater than ever and presents a unique opportunity to address the challenges of energy security, climate change and economic development. An increase in Member States' building energy performance would allow the European Union to comply with the Kyoto Protocol, and to honour both its long term commitment to maintain the global temperature rise below 2°C and its effort to achieve the 20/20/20 targets by 2020.

Financing Energy Efficiency in buildings is still a major challenge. Despite the proven cost-effective opportunity to reduce energy consumption, a significant proportion of the energy efficiency improvement potential is not being realised. Several barriers and market failures inhibit energy efficiency improvements in buildings. Information failure, high subsidies, lack of technical expertise, uncertainty over savings, and externalities still characterise the energy efficiency market. Residents of established households do not easily change their energy consumption habits and, in most cases, the so called "split incentive" discourages both building owners and building occupiers from investing in energy efficiency measures if direct benefits are not perceived. Financial barriers are crucial in inhibiting investment in energy-efficient building refurbishment. Such barriers include, inter alia, initial cost barrier, high transaction costs, long payback time, and risk exposure. Furthermore, traditional financing investment criteria do not apply to energy efficiency investments, lack of knowledge among finance providers of energy efficiency specificities prevents customers from accessing capital, and the absence of standardised measurement and verification practice further increases transaction costs. Due to the considerable impact of these financial barriers on the financing of energy-efficient building refurbishments, the paper focuses primarily on these barriers.

It is important to address existing barriers and stimulate a more active uptake by the market. Specific instruments have been successfully implemented both at the European and national level to overcome financial barriers. European Union financial instruments and other measures are being put into place or adapted with the aim of stimulating energy efficiency related measures. These include, inter alia, structural and cohesion funds, the public-private partnership on 'European energy-

[1] Directive 2010/31/EU

efficient buildings' initiative[2] , the Competitiveness and Innovation Framework Programme, the Covenant of Mayors and the Seventh Research Framework Programme. Member States have launched several programmes[3] and instruments ranging from R&D actions, educational measures, public investment measures, financial instruments and incentives/subsidies, to regulatory instruments. Private actors, such as banks, have increasingly joined forces with large public institutions to offer preferential loans and other financial incentives to customers. Europe's financial institutions have also been adapting their products and services to the energy efficiency market.

It is also important to identify which are the most promising approaches with the highest potential for larger-scale implementation. Funding programmes and financing tools should be better employed to support energy-efficient retrofitting projects and to boost investment in this area. Providing technical assistance, for instance, for the development of energy efficiency investment projects. The application of grants and fiscal incentives for energy saving measures in the household sector have contributed to CO_2 reduction, energy saving, and the creation of market demand. A combination of different tools may be more effective than single measures over the long-term. Examples include the creation of revolving funds using part of the ERDF allocation funds with additional funding from other investors (public and private), preferential loans within national programmes (e.g. combination of funding originating from capital markets and interest rates subsidised by government), and new ESCo business models. Energy savings obligations imposed by governments could possibly increase investment in energy efficiency as in the White Certificate Scheme, or the creation of an agency which manages retrofitting of private buildings where average CO_2 reductions are clear criteria of public tenders. Strong political will is essential to pave the way for private investors. The building sector should be seen as a priority area, and market-based instruments could be turned into funding streams to support investment in energy efficiency. Finally, public-private partnerships will offer great opportunities to simultaneously address different aspects of these financial barriers as new links between the public sector, industry and research organisations are established.

There are a number of key questions that need to be addressed in order to help the market transformation. Even if we are not going to solve all of them, we can see these as a good starting point. It is one of the biggest challenges of today, but in order to advance, we need concerted actions.

---

[2] http://www.e2b-ei.eu/default.php

[3] Major renovation programmes put in place by Members States include: Klima:aktiv Programme 2004-2012 (Austria), National Programme for Renovation of Residential Buildings in the Republic of Bulgaria 2006-2020 (Bulgaria), National Environmental Fund: "Green to Savings" 2009-2012 (Czech Republic), Renovation Fund 2009 ongoing (Denmark), No interest loans for Energy retrofits (ECO PTZ) 2009 ongoing (France), KfW CO_2 Building Rehabilitation Programme 2001 ongoing (Germany), National Energy Conservation Programme 2002 ongoing (Hungary), More with Less Programme 2008-2020 (The Netherlands), Thermo-modernisation fund 1999-2016 (Poland), Programs for the thermal rehabilitation of multi-level residential buildings 2002 ongoing (Romania), Financial stimulation for Energy efficiency renovation and sustainable building of new buildings 2008-2016 (Slovenia), Support for Energy Efficiency in Buildings 2008-2012 (Spain), Carbon Emissions Reduction Target 2008-2012 (UK).

- Which instruments and measures suit most in addressing first cost barriers? Financial incentives and fiscal measures are important in reducing transaction costs and perceived risks; Preferential loans specifically target the initial cost barrier; Market-based mechanisms also stands to have a great impact; ESCOs have a strong transition impact to deliver energy savings and offer a win-win solution to end-users; Public-private partnerships offer vast opportunities to address different aspects of the financial barrier simultaneously. What other types of policies and measures should accompany the financial instruments?

- How to put in practice the right mix of policies and measures that will induce decision-makers to make these heavy investments in view of long payback periods? The financial viability of major projects to improve the thermal integrity of buildings is highly site specific. Even in the best cases, investment payback periods for such projects are usually significantly longer than for efficiency measures in new buildings.

- How to best make use of European instruments? Several programmes and initiatives, including R&D activities, have been set up at European level to support energy efficient retrofitting projects; In the short term, structural funds have a key role to play in greening national and regional spending programs, however appears not to be fully used. Why? The establishment of revolving funds is also a promising option to overcome long repayment period of the projects.

- How to create a market for improved EE of buildings? The deep renovation of a huge amount of European buildings, further than its other remarkable benefits, is expected to have a consistent impact on employment both directly and indirectly. Ambitious major renovation programmes would have the capacity to re-launch not only the construction industry, but to help the entire economic recovery process. Industry and commercial banks should be encouraged to exploit the advantages that such an EE market can offer.

- Who should do what? Why have some examples worked and some others not? There is perhaps a need to define at country level the role and responsibilities of the various governmental organisations, banks and professional associations. What can the IFIs (International Financial Institutions) do at Member State level? The private sector also has to assume a key role and be rewarded for it.

INTRODUCTION

Increasing energy efficiency in all consuming sectors plays a vital role in coping with future energy challenges. Reducing energy consumption by increasing energy efficiency is a highly successful way of meeting the key energy policy targets of supply security, affordable costs of energy services and environmental reliability.

Energy efficiency has moved up the political agenda in recent years. Worldwide, concrete saving targets are part of the EU's "20-20-20 by 2020" strategy, agreed by EU heads of state and government at their 2007 summit.

Residential buildings are among the main consumer of final energy. While only some new buildings benefit from model energy performance, the majority of saving potential must be realised in the vast building stock already in existence.

Retrofitting older, inefficient houses is the biggest challenge in Europe, offering an opportunity to apply cost-effective measures and to transform them into resource-efficient and environmentally friendly buildings, with an increased social and financial value. The European Union has already assumed the role of leading the challenge toward a more sustainable development by putting energy efficiency and energy saving among its main priorities.

The potential is high for achieving economic savings through building energy efficiency refurbishment measures. Detailed analysis shows that there is a clear path towards achieving the necessary energy savings in buildings. The IPCC, McKinsey and others have estimated that by 2030 about 30% of the projected GHG emissions in the building sector can be avoided at zero or even negative cost. It is clear that financial, behavioural and knowledge barriers must be overcome for individuals, governments and businesses to aggressively adopt energy saving options[4].

But what are the appropriate financial instruments and measures to bring about energy efficiency investment through building retrofitting?

Worldwide, countries and regions have embraced increasingly forceful measures and support programmes to help improve the performance of the existing building stock. However, the level of success is far from satisfactory as a comprehensive approach to building refurbishment is frequently not aimed at.

[4] Transforming the market _ EE in buildings. World Business Council for Sustainable Development (2009)

Consequently, large saving potentials are neglected in the refurbishment process and these potentials cannot be considered again until the next building refurbishment cycle comes some 30 years later[5].

Furthermore, while the ongoing economic crisis has temporarily decreased energy demand and related GHG emissions, the uncertainty this has created is putting the brakes on many critical energy projects and risks, slowing down energy technology development.

Today, there is an urgent need to support all suitable political, regulatory and market-based instruments for the implementation of energy efficiency in buildings' retrofitting. Institutional innovation is required to address these problems and put in place efficient ways of identifying, packaging, and delivering bundles of energy saving projects.

Lessons learned from EU Member States on Financing Energy Efficiency reveal the nature of the various barriers and how they may be overcome in practical and operational terms. Most successful initiatives have been built following careful in-country analytical work, with equivalent attention to both financial intermediation and technical support requirements and with the flexibility to make many adjustments along the way.

This paper reviews the common instruments and measures, with twelve practical case studies covering a range of energy efficiency policy instruments and measures across Europe. The aim is to prepare the analytical basis for an in-depth discussion on:

"How to secure the energy efficiency financing in buildings' retrofitting", and "how to contribute to the future generation of new ideas and approaches on scaling up energy efficiency investments".

The greatest challenge is the development of successful strategies for retrofitting existing residential buildings through an effective mix of policy instruments and measures.

Due to a lack of sufficient data, indicators were not possible in all case studies. Consequently, it is difficult to determine which of the available instruments is the most cost-effective. Furthermore, the great variety in the different tools makes comparison between them difficult.

[5] Comprehensive Refurbishment of Buildings through Energy Performance Contracting. IEA DSM Task XVI

ENERGY EFFICIENCY POTENTIAL IN THE BUILDING SECTOR

ENERGY EFFICIENCY POLICY AT EU LEVEL

Reducing energy consumption is one of the main goals of the European Union. Energy efficiency and energy saving are the most cost-effective way of reducing energy consumption while maintaining an equivalent level of economic activity[6]. Increasing building energy performance can be an important instrument in efforts to alleviate the EU's energy import dependency, and support the 2020 target of reducing GHG emissions to 20% below 1990 levels, and by 30% in the event of an international agreement being reached, and to honour its long term commitment to maintain the global temperature rise below 2°C [7]. Besides, measures taken to reduce energy consumption would allow the European Union to comply with the Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC).

On 19 October 2006 the Commission adopted the Action Plan for Energy Efficiency: Realising the Potential (EEAP)[8]. It provided an outline for a coherent framework of legislation, policies and measures with a view to saving a substantial part of the 20% of EU annual primary energy consumption by 2020. It also proposed a selection of cost-effective energy efficiency improvement initiatives to be put in place and implemented by 2012.

In its March 2007 conclusions, the European Council identified energy efficiency as an essential part of the comprehensive strategy on climate change and energy, and stressed the need to achieve the objective of a 20% saving of EU energy consumption by 2020[9].

Buildings have an impact on long-term energy consumption. Given the long renovation cycle for existing buildings, new and existing buildings that undergo major renovation should therefore meet minimum energy performance requirements adapted to the local climate. Clearly, the best moment for the introduction of energy efficiency measures is when the buildings undergo major renovation (approx. every 25-40 years)[10].

The European Union's most important instrument for improving energy efficiency in buildings is the Energy Performance of Buildings Directive (EPBD)[11], which seeks to create a common framework to improve energy performance of public, commercial, and private buildings. On 18 May 2010, a recast of the Directive (2002/91/

[6] COM (2006) 545

[7] Directive 2010/31/EC

[8] COM (2006) 545 final

[9] COM(2008) 11 final

[10] COM(2008) 780 final

[11] Directive 2002/91/EC on the energy performance of buildings

EC) was adopted in order to strengthen energy performance requirements and to clarify and streamline some of its provisions[12]. More emphasis is given to buildings that undergo major renovation as illustrated in Art. 7, Art. 9, and Art. 10 of the new Directive 2010/31/EC.

ART. 7 EXISTING BUILDINGS

Member States shall take the necessary measures to ensure that when buildings undergo major renovation, the energy performance of the building or the renovated part thereof is upgraded in order to meet minimum energy performance requirements set in accordance with Article 4 in so far as this is technically, functionally and economically feasible.

Those requirements shall be applied to the renovated building or building unit as a whole. Additionally or alternatively, requirements may be applied to the renovated building elements. (.....)

ART. 9 NEARLY ZERO-ENERGY BUILDINGS

2. Member States shall furthermore, following the leading example of the public sector, develop policies and take measures such as the setting of targets in order to stimulate the transformation of buildings that are refurbished into nearly zero-energy buildings, and inform the Commission thereof in their national plans referred to in paragraph 1. (.....)

ART. 10 FINANCIAL INCENTIVES AND MARKET BARRIERS

1. In view of the importance of providing appropriate financing and other instruments to catalyse the energy performance of buildings and the transition to nearly zero- energy buildings, Member States shall take appropriate steps to consider the most relevant such instruments in the light of national circumstances.

2. Member States shall draw up, by 30 June 2011, a list of existing and, if appropriate, proposed measures and instruments including those of a financial nature, other than those required by this Directive, which promote the objectives of this Directive.. (.....)

Existing buildings that are subject to major renovation, should therefore meet minimum energy performance requirements, with a view to achieving cost-optimal levels. Financial instruments should be used to give practical effect to the objectives of this Directive. In particular, they should be used for providing appropriate and innovative means of financing to catalyse investment in energy efficiency measures.

[12] Directive 2010/31/EU - published in the Official Journal on 18 June 2010

The Directive 2006/32/EC on energy end-use efficiency and energy services[13] has also stressed the need for improving energy end-use efficiency and energy services, in particular by creating stronger incentives for the demand side. Under the Directive, each EU Member State has prepared its National Energy Efficiency Action Plan which describes the energy efficiency improvement measures planned at national level to achieve the energy savings target of the Directive. Moreover the Directive defines the Energy Service Company (ESCo) and its role in delivering energy efficiency contracts.

A proposal for the reallocation of uncommitted funds of around EUR 114 million from the EEPR Regulation[14] to the financing of projects in the areas of energy efficiency and energy from renewable sources is currently under discussion[15].

OVERVIEW OF THE CONSTRUCTION SECTOR AND ENERGY CONSUMPTION IN BUILDINGS

The construction sector is one of the major engines of Europe's growth. It represents nearly 10% of EU Gross Domestic Product, with more than 3 million enterprises, most of which are SMEs, and provides jobs to nearly 15 million workers[16]. Within the industry, the buildings sector - residential and non-residential – represents the largest economic area. Indeed, it represents the highest energy consumer in the EU-27 and is one of the main contributors to GHG emissions, accounting in 2007 for about 40% of the EU's total final energy consumption, 63% of which was in the residential sector[17].

The current European housing stock comprises approximately 160 million residential and non-residential buildings[18]. More than 50% of existing residential buildings were built before 1975[19] and about one third of the dwellings were built during the period 1975-1990. Consequently, more than 50% of this stock will still be standing in 2050 in many European countries.

Low housing standards and the high concentration of dwellings in multi-storey buildings imply a great need for refurbishment, an increase in the quality and the quantity of the surface area available to dwellers[20].

Scenario studies expect the demand for electricity to rise, due to the increasing use of appliances, demand for cooling and number of households. Besides, consumers are becoming progressively more demanding, particularly concerning the level of comfort. Flexible working is also on the rise, with an increasing proportion of the population working at home.

---

[13] Directive 2006/32/EC on energy end-use efficiency and energy services

[14] Regulation (EC) No 663/2009 of the European Parliament and of the Council of 13 July 2009

[15] COM(2010)283 final European Commission

[16] FIEC PRESS RELEASE – 1/6/2010

[17] EU Energy and Transport in figures, statistical pocket book 2010

[18] Energy-Efficiency Buildings (EeB) PPP – Multi-Annual Roadmap and Longer Term Strategy 2010

[19] Energy Efficiency in Buildings – Transforming the Market –WBCSD 2009

[20] Housing Statistic in the European Union 2005/2006 – Min. of infrastructure of the Italian Republic, Federcasa

Retrofitting older, inefficient buildings is the biggest challenge in Europe, offering an opportunity to apply cost-effective measures and transform them into resource-efficient and environmentally friendly buildings, with an increased social and financial value[21].

Opportunities exist to improve the energy performance of the existing buildings, reducing the thermal energy demand and increasing the renewable energy production[22]. A wide improvement in energy demand is possible, moving from more than 300 kWh/m^2 to 50 kWh/m^2 per year, with a strong impact in terms of decreased energy use and reduced emissions of CO_2[23].

[21] Currently, the number of refurbishments accounts for less than 1%. Study on the Energy Savings Potentials in EU Member States, Candidate Countries and EEA Countries (Final Report)

[22] Household energy requirements are closely linked to climatic conditions. Consequently, Energy Efficient improvements are undertaken differently in different climates

[23] Energy-Efficiency Buildings (EeB) PPP – Multi-Annual Roadmap and Longer Term Strategy 2010

TYPICAL BARRIERS TO FINANCING ENERGY EFFICIENCY

THE RESIDENTIAL BUILDING CONTEXT

The residential building sector is characterised by a set of specific obstacles to energy efficiency improvements. Despite the proven cost-effective opportunity to reduce energy consumption, a large portion of the potential for energy efficiency in the existing residential building sector remains untapped, creating the so called "energy efficiency gap" [24].

Energy efficiency is not usually a major concern for consumers or companies as energy costs are relatively low compared to the cost of many other factors. Numerous studies reveal that consumers invest in upgrades of their buildings for safety, health, comfort, aesthetics, reliability, convenience, and status reasons. Consequently, there is little incentive to invest in energy efficiency improvements.

Typical barriers to improving the efficiency of homes include:

- High transaction costs. The time and effort required to get enough information to make a decision, apply for a loan, and arrange for the work to be done may simply be perceived not to be worth the return in terms of energy savings[25]. A more detailed discussion is presented in the next section.
- Institutional barriers. Existing laws or practices hinder improvements in energy efficiency. Often this is a result of prejudice in favour of increased energy supply, rather than improved energy efficiency. Governments generally take a more "hands off" approach to energy supply[26].
- Lack of information. Many customers do not know how to implement energy efficiency measures, or understand and have confidence in the benefits of a project. The lack of customer awareness of the benefits of energy efficiency, both financial and environmental, also reinforces the challenge posed by consumer behaviours and habits which are difficult to change. Studies show that it takes on average more than 10 years to dramatically change consumer tastes[27]. Moreover, typical penetration rates of new technologies oscillate between three to four years[28].

---

[24] IEA, 2007b

[25] Enabling Investments in Energy Efficiency – Merrian Fuller (August 2008)

[26] Towards Energy Efficient Buildings in Europe - Final Report - EuroACE (June, 2004)

[27] Eto & Golove, 1996

[28] Financing Energy Efficient Homes – OECD/IEA (February 2007)

- Energy prices. Another barrier included in information failure is known as price distortion. Energy is often heavily subsidised. As a consequence, excessive subsidisation of energy prices can distort the markets, and prevent consumers receiving accurate price signals that reflect the true marginal cost of the energy use.

- Lack of trained personnel or technical or managerial expertise. The majority of actors in the building chain do not have adequate training and knowledge about energy efficiency. Suppliers, manufacturers, promoters, and financiers alike, tend to lack the necessary skills to adequately promote energy efficiency products to their customers.

- Uncertainty associated with energy savings. On average, a set of measures might produce a predictable level of savings, but savings can never be perfectly predicted for an individual home. The different methods existing for ex-ante evaluation maintain a certain level of uncertainty, and help create a fear of hidden risks in energy-efficient projects. On the other hand, systematic ex-post evaluation is still too costly. Accordingly, both investors and customers with no certainty of the level of energy savings to be achieved, tend to shy away from energy efficiency investments.

- Split incentives. Split incentives occur when the decision-maker does not directly receive many of the benefits from a measure invested in. It applies to both residential and commercial buildings and means that the benefit of energy savings does not go to the person making the investment. In fact, the building owner is likely to be responsible for making energy efficiency investments, while the occupier may receive the benefit of lower energy bills. Consequently the owner has no direct incentive to invest although landlords may benefit from higher rents. Furthermore, if the landlord is responsible for energy bills, the tenant has no direct incentive to save energy. As a result, investing in energy efficiency upgrades is not a natural move for either actor[29].

- Externalities. Environment, energy security, social policy and employment may occur as a barrier to investment in energy efficiency. There is still a major issue concerning how to internalise the costs of externalities such as environmental damage[30].

[29] Complicated relationships also exist between the landlord and the tenant due to billing practices. Frequently, tenants do not pay specifically for the energy used. Many apartments in multi-occupied blocks do not have individual heating systems or meters to measure consumption. Heating costs may be included in the rent or charged to tenants based on criteria such as floor space. Therefore, tenants do not have incentive to save energy.

[30] Towards Energy Efficient Buildings in Europe - Final Report - EuroACE (June, 2004)

FINANCIAL BARRIERS

This section underlines the barriers specifically related to financing Energy Efficient investments. They include:

- Access to capital: initial cost. The initial cost of a project may prevent investment, either because a resident does not have access to capital or has higher-priority items for investment[31]. Energy-efficient measures tend to be more expensive than their less efficient counterparts. Studies demonstrate that, even when consumers are assured they are investing in an energy-efficient measure, they tend to stick to the least efficient one, because of the low initial cost[32].
- Risk exposure. The ratio of the risk exposure to the return on investment of a project is a significant indicator for the investment's validity for a financier. Energy efficiency projects often do not meet the common criteria typically used to factor in risk in the evaluation of a project. Commercial bankers typically select investments which are safest and grant medium return on investment. On the other hand, speculators or hedge fund managers are more likely to take on risky investments. Energy-efficient investments in individual buildings are not large enough to attract speculators and are perceived as too uncertain for commercial bankers[33].
- Discount rate. The current high discount rate is usually justified on account of the riskiness of the investments. Depending on one's standpoint, energy-efficient investment can be viewed as extremely risky or not risky at all. Energy efficiency investment projects are a safer option when considering that they reduce an individual's exposure to the volatility of fuel price, which is by far the most important risk in an energy project. In the meantime, the uncertainty surrounding the appropriate evaluation method helps to shy away investors from energy efficiency projects. The prevailing traditional view, however, is to consider energy efficiency projects as risky investments, and as such to apply a high discount rate.
- Payback time. It is common practice for investors to refer to the payback time as an indicative value of their investments (i.e. the time it will take them to earn back their initial investment). Energy-efficient projects tend to have a longer payback period than more classical investments; hence they do not rank high on financiers' agendas. This measure is particularly inappropriate in the building sector context since a building's lifetime usually exceeds

[31] Enabling Investments in Energy Efficiency – Merrian Fuller (August 2008)

[32] Brown, 2001

[33] Financing energy efficient homes – OECD/IEA (February 2007)

30 years or more[34], therefore it does not take into consideration benefits accrued after the payback time such as an increase in overall well-being, health conditions, or job improvement in the cost/benefit analysis. Referring to payback time as the only reference point for investment validity also prevents proper consideration being given to the importance of the public good aspect of energy efficiency. Despite its inappropriateness, reference to the payback time is still common and represents an obstacle to energy efficiency projects.

- Lack of financier awareness. Financiers who are not trained on energy efficiency issues do not naturally promote funding for such projects, and do not know what to say when asked about it. Hence, obtaining qualified advice from financial experts is not easy for consumers who want to implement energy efficiency. Furthermore, the risk exposure of the project, the payback time and the rate of the return on investment[35], are the three factors a financier usually looks at when choosing between investments. Both investment criteria and the financier's lack of knowledge about energy efficiency specificities are obstacles to customer access to capital for energy efficient projects.
- The absence of standardised measurements and verifications practice. The need for financiers to spend more time on the evaluation of every single energy-efficient project, compared to the average time they will spend on other investments, has a considerable negative impact on energy efficiency projects. Further increases in the transaction costs related to energy efficiency projects is an indirect consequence of the lack of standardisation in the measurement and verification procedure.
- Size. The relatively small size of energy-efficient projects compared to other investments further reinforces the increased transaction costs related to energy efficiency projects. The high uncertainty surrounding energy savings measures, the high risk associated with the projects, the difficult project replicability and the small size of energy efficiency projects all contribute to higher transaction costs for the projects. As such investors tend to turn to other projects which are more easily replicable.

[34] Financing energy efficient homes – OECD/IEA (February 2007)

[35] Return on Investment (ROI) is the ratio of money gained or lost on an investment to the amount of money invested. The amount of money gained or lost may be referred to as interest, profit/loss, gain/loss, or net income/loss. The money invested may be referred to as the asset, capital, principal, or the cost basis of the investment. It is not the same thing as time, or internal rate of investment.

FINANCIAL SOLUTIONS FOR BUILDING RETROFITTING

The next section presents an overview of various policies and programmes currently implemented to overcome financial barriers based on literature (selection). For each given instrument and measure the generic principle, with pros and cons when available, are illustrated together with one or two real case studies.

FUNDING SOURCES

EU FINANCIAL OPPORTUNITIES: FUNDING PROGRAMMES

Increased financial support has been made available for best-practice exchange initiatives, research and eco-efficient refurbishment works through a range of funding programmes managed at EU level such as the European Research Framework Programme and the Intelligent Energy Europe II Programme, and through nationally-managed funds such as the European Structural and Cohesion funds. Furthermore, Europe's financial institutions, in particular the Council of Europe Development Bank (CEB) and the European Investment Bank (EIB) are active in all Member States and have also been adapting their products and services to the energy efficiency 'market'. The European Bank for Reconstruction and Development (EBRD) also provides funding with the aim of stimulating measures related to energy efficiency.

CASE STUDY: ELENA FACILITY

TITLE	ELENA (European Local Energy Assistance)
WHO	EIB in collaboration with the European Commission
AMOUNT	EUR 15 mill. (2009 budget[36]) - EUR 15 mill. (2010 budget)
DESCRIPTION	The Facility aims to prepare investment programmes in cities that can then be replicated in other cities or regions. Technical assistance (TA)[37] can be provided to a local or regional authority or other public body or a grouping of such bodies coming from the IEE II participating countries. The TA is intended to develop large investment programmes and a minimum leverage factor of 25 must be achieved between the investment and the grant. In accepting the TA the beneficiary accepts that the amount received will have to be repaid in the event of the leverage factor not being achieved.
INDICATORS	n/a

[36] The facility is funded from the Intelligent Energy Europe II (IEE) programme.

[37] Supported by the ELENA facility at a maximum rate of 90%

STRUCTURAL FUNDS

The Structural Funds were established by the EU member states in order to support regional growth agendas and to stimulate job creation. The current Structural Funds package for 2007-13 amounts to EUR 308 billion, making up 35.7% of the total EU budget. They play a key role in greening national and regional spending programmes and serve as a lever for the release of additional public and private funds.

Structural Funds can be used to help finance national programmes and projects aimed at improving energy efficiency in the residential sector. In particular the European Regional Development Fund (ERDF) aims at promoting public and private investment to help reduce regional disparities across the European Union. Housing expenditure related to the renovation of common parts of multi-family buildings, as well as energy efficiency operations, has been eligible in the EU-12 countries since 2007. However, existing data demonstrates that a small percentage of total fund allocations are being used for energy efficiency measures[38] (this can be considered more a market failure rather than a market barrier).

In April 2009, an amendment to the regulation on the European Regional Development Fund (ERDF) was adopted[39] stating that *"in each Member State, expenditure on energy efficiency improvements and on the use of renewable energy in existing housing shall be eligible up to an amount of 4 % of the total ERDF allocation"*[40]. The ERDF can consequently co-finance national, regional and local schemes related to energy efficiency improvements also in the residential sector with a potential of EUR 8 billion up to 2013[41].

Structural Funds can be combined with loans from financial institutions to create revolving financing instruments for energy efficiency in cities. Revolving funds offer loans which can be repaid with the extra cash available due to energy savings. The repaid loans are used to finance new energy efficiency projects.

- PROS[42] : Direct impact on the financial barrier issue[43]
- CONS: Temporary impact on the financial barrier issue[44]

[38] Unlocking a low-carbon Europe - perspectives on EU budget reform – Green Alliance 2010

[39] European Economic Recovery Plan (2009)

[40] Regulation (EC) No 397/2009 amending Regulation (EC) No 1080/2006

[41] CECODHAS

[42] PROS and CONS related to revolving funds

[43] Financing energy efficient homes – OECD/IEA (February 2007)

[44] See note above

CASE STUDY: ESTONIA

TITLE	Revolving fund scheme for energy refurbishment in housing
WHO	ERDF, CEB, KredEx
AMOUNT	EUR 49 million (+ 15% self-financing, total EUR 57 million)
DESCRIPTION	The aim is to support the renovation of apartment buildings and to raise their energy efficiency at least by 20%, by improving the accessibility of loan capital through KredEx[45]. Favorable conditions arise from the combination of zero interest means with outside financing[46]. Long time low interest loans are offered for apartment buildings to achieve energy efficiency[47]. Fixed interest for 10 years, interest rate between 3.7% - 4.2%. Maturity up to 20 years. Start: 24.06.2009
INDICATORS	Ex-Post evaluation: - Average energy savings: 33% - Total amount lent: 10.2 million (by 31.07.2010) - Average cost for building refurbishment: EUR 76,600 - N° of multi-apartment buildings refurbished: 122 (July 2010)

In Estonia, EU Structural Funds have been combined with loans from the CEB to form a fund for housing refurbishment as shown in the figure 1.

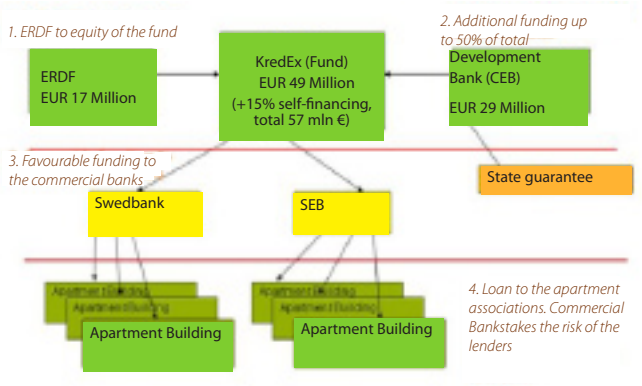


Figure 1. KredEx Revolving Fund Scheme[48]

The economic crisis has slowed down demand for loans as the unemployment rate is increasing and people are careful about taking on loans. By contrast, building prices are falling, builders are interested in refurbishing work and people are interested in reducing the energy costs.

Estonia has sold AAU and in August a grant scheme for multi-apartment buildings will be opened. The grant amount will be 15%, 25% or 35% depending on the measures taken in the building. This grant will cover at least the self-financing part of the low interest loan.

[45] The Credit and Export Guarantee Fund KredEx was founded in 2001 by the Ministry of Economic Affairs and Communications to improve the financing of enterprises in Estonia, decrease export-related credit risks, enable people to build or renovate their homes and promote energy efficiency in Estonia.

[46] With the loans only finance of energy efficiency investments are allowed. Energy audit is obligatory to obtain loans, as the loans can only be allocated to investments that are covered by the energy audit. Another main objective is to estimate energy savings that will be achieved by renovation works.

[47] http://urbenergy.eu/ (Average maturity is 13 years (maximum can be 20)

[48] Source: www.urbenergy.eu

CASE STUDY: LITHUANIA

TITLE	The JESSICA Holding Fund in Lithuania[49]
WHO	ERDF, the Ministry of Finance, the Ministry of Environment of Lithuania and the EIB
AMOUNT	EUR 227 million (ERDF of EUR 127 mill. + National funding of EUR 100 mill.)
DESCRIPTION	The purpose is to invest funds in housing energy efficiency projects through the banking sector in Lithuania. Target groups are multifamily building built before1993. It provides long-term loans with fixed interest rate of 3% p.a. Established in June 2009.
INDICATORS	Output targets[50] **:** - Number of houses to be refurbished: 24,000 houses by 2020 - Average energy savings for a single house: approximately 50% or 125 MWh a year (in total - ~ 3 TWh).
UDF	Local banks. First UDF signed in May 2010 – Siauliu Bankas AB

The JESSICA[51] mechanism is a financial engineering instrument based on co-operation between the EC and the EIB, in collaboration with the Council of Europe Development Bank (CEB). It has been designed to help the authorities in all EU Member States exploit financial engineering mechanisms to support sustainable urban projects[52] eligible for EU Structural Funds in the context of the cohesion policy. These investments, which may take the form of equity, loans and/or guarantees, are delivered to projects via Urban Development Funds and, if required, Holding Funds[53].

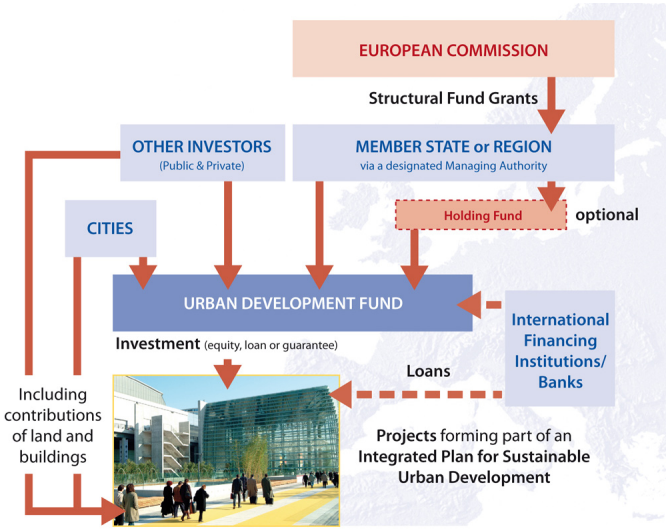


Figure 2. The JESSICA model[54]

[49] This is one of the largest JESSICA holding funds established so far and also one of the first to be launched.

[50] Estimates by Housing and Urban Development Agency, Lithuania

[51] Joint European Support for Sustainable Investment in City Areas

[52] To be eligible for JESSICA, Member States should include an urban agenda in their operational programmes and, ideally, also include a statement on the potential use of JESSICA in fulfilling this agenda. Member States decide on the proportion of their Structural Funds to be allocated to JESSICA.

[53] Holding funds are those investing in more than one urban development fund, providing them with equity, loans or guarantees. In such cases, the authorities will have the option of appointing EIB without tender, as holding fund manager. http://ec.europa.eu/regional_policy/funds/2007/jjj/jessica_en.htm

[54] Source: EIB

FINANCING

GRANTS, SUBSIDIES AND FISCAL MEASURES

Grants and subsidies are economic incentives generally applied when governments consider that the market will not provide the optimal level of energy efficient investments because of access to capital (Malinvaud, 1998). According to WEC/ADEME (2004), subsidies in the building sector are generally part of large retrofitting programmes. However they can have a direct or indirect impact on the energy efficiency of existing buildings, either because they affect maintenance, renovation and retrofit measures in general or because they are specifically designed to promote EE and renewable energies.

- PROS: Direct impact on the market as they directly fill in an immediate financial gap and allow at least a temporary shift in the market.
- CONS: Tendency of not having a long lasting impact on the market . Lack of flexibility. "Free Rider" problem[55] .

CASE STUDY: DENMARK

TITLE	Grant for energy saving measures in pensioners' dwellings
WHO	Danish Energy Authority
AMOUNT	About DKK 44 million per year [56] (approx. EUR 6 million per year)
DESCRIPTION	The scheme provided subsidies for energy-saving measures in pensioners' dwellings. Pensioners had to receive heating assistance in order to qualify for a subsidy, and measures taken had to help reduce heating consumption. Subsidies were granted up to 50% of the cost covered by the scheme. They could be granted several times, though not in excess of EUR 3,334 per dwelling. Starting Year: 1993 - Ending Year: 2003
INDICATORS	Ex-post evaluation[57] : - Direct CO_2 (kt): 170,000 (in 2010) - Energy (TJ) Fuels/Electricity: 2,400 (in 2010) In addition, the improvements gave better comfort in the houses.

[55] When financial incentives are used to encourage investment in energy efficiency, free riders are those who benefit from the incentives, but who would have made the investment even without the incentive

[56] Danish Energy Saving Report, May 2003 - Draft translation

[57] Evaluation of effect is based upon an estimated saving (generally oil) per dwelling of 35 GJ annually, and future subsidies to 4,000 dwellings annually (MURE database)

Fiscal measures aim to encourage actors to implement more energy-efficient investments. The government seeks to promote energy efficient use by providing fiscal schemes through tax reduction/exemption and tax credit.

- PROS: Relevant financial tools as they specifically target the liquidity barrier. Aims at creating demand from the market. Offers significant flexibility (more room for market transformation and creativity is given).
- CONS: Lack of transparency: often not understood by all actors in the market. Needs to last a long time to make sure the market has time to adjust and has created adequate, long lasting tools. The Ministry of Finance normally does not see them as appropriate; or it has other priorities.

CASE STUDY: ITALY

TITLE	Fiscal incentives for energy savings in the household sector
WHO	Ministry of Economy and Finance, Ministry of Economic Development / ENEA, Unità Tecnica Efficienza Energetica
AMOUNT	Fiscal deduction of 55%
DESCRIPTION	Fiscal deduction of 55% of expenses for works directed to improve existing buildings performances, spread over 5 years and available for people and companies. For each type of works, a maximum threshold is set as well as a minimum energy performance target to be reached. The improvements of the following works are financed for the moment, until 31 December 2010: the replacement of heating system; the installation or the replacement of solar thermal panels; the insulation of opaque vertical or horizontal surfaces and the replacement of windows with others more efficient; total renovation of the building.
INDICATORS	Ex-post evaluation[58]: - Documents received that attest realised works: 106,000 (in 2007), 247,800 (in 2008), 238,000 (in 2009, provisional data); - Yearly primary energy saving (GWh/year): 787 (in 2007) 1,961 (in 2008), 1.670 (in 2009, temporary data); - CO_2 not emitted (kt/a): 167.4 (in 2007), 418 (in 2008), 355 (in 2009, temporary data); - Total cost of works : EUR 1,453 mill. (in 2007), EUR 3,500 m. (in 2008), EUR 2,930 m. (in 2009), with deduction (55% of the total amount): EUR 799 m. (in 2007), EUR 1,925 m. (in 2008); - Support to economic sector, green economy and green jobs[59].

[58] ENEA,Unità Tecnica Efficienza Energetica– September 2010

[59] According to two detail reports, just written

PREFERENTIAL LOANS

Preferential loans are generally initiated to attract customers to a particular scheme. In most cases, they are built through public-private partnerships where the government provides a fiscal incentive to the bank, which in turn offers a preferential interest rate to its customers[60].

- PROS: Address the higher investment cost by reduced interest rates and/or better loan terms. Financial benefits give a signal to the market about desired improvements.
- CONS: May not be adequate to attract investment.

CASE STUDY: GERMANY

TITLE	The CO_2 Building Rehabilitation Programme[61]/Energy Efficient Construction and Rehabilitation
WHO	KfW (promotional bank) and German government
AMOUNT	EUR 8.9 billion (in loans) in 2009
DESCRIPTION	It supports extensive energy rehabilitation measures in residential buildings completed in 1983 or earlier. Applicants are owners of single-family or two-family houses or private apartments in home ownership associations or housing companies. The programme is financing full energy rehabilitation, single energy efficiency measures or the construction of new buildings, if the legal energetic requirements are substantially being exceeded. Financial support is provided by loans (fixed interest rate for 10 years, redemption grant/bonus for rehabilitation according to EnEV, financing of investment costs up to 100%, advance repayment without additional fees, combinations with other KfW-loans or grants).
INDICATORS	Evaluation[62] : - CO_2 emissions saving: about 0.74 million t. annually by 2009 rehabilitation measures - Energy savings: around 2,090 GWh by 2009 rehabilitation measures only.

[60] Promoting Energy Efficiency Investments – IEA 2008

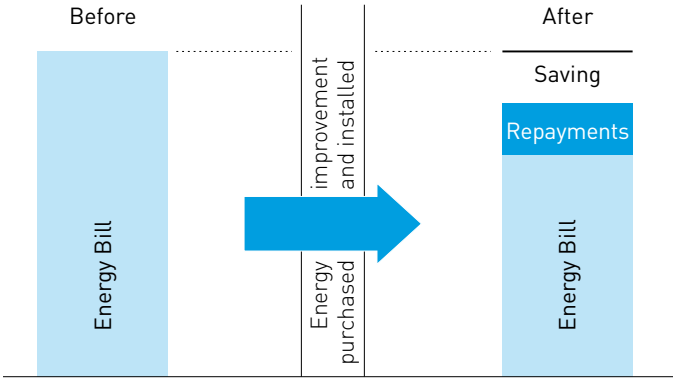
[61] Since 2001 the CO_2 Building Rehabilitation Programme forms part of the German national climate protection programme.

[62] http://www.kfw.de/kfw/DE_Home/Research/Evaluationen/CO2-Gebaeudesanierungsprogramm.jsp

CASE STUDY: UK

TITLE	Home Energy Pay As You Save (PAYS) pilots
WHO	The Government
AMOUNT	£4 million
DESCRIPTION	Launched in December 2009, it will run until April 2011. These pilots are testing consumer interest in PAYS, which offers householders capital to meet the upfront costs of installing energy efficiency and renewable energy measures to existing homes. Householders then repay this finance through instalments that are lower than their energy bill savings. The pilots are being run in 5 areas in England by a variety of partners: Birmingham City Council, British Gas (in Sussex and Surrey), B&Q UK (Working with Sutton Council), Gentoo (in Sunderland) and Stroud District Council.
INDICATORS	Householder attitudes to PAYS are being tested as well technical monitoring

An important barrier to improving the energy efficiency of homes is that homeowners move, on average, about every twelve years, more often in many parts of the country. This is generally not enough time for the bill reductions to cover the upfront costs, i.e. the householder undertaking the improvement loses money.



The basic principle of PAYS

Figure 3. Pay As You Save model[65]

The PAYS solution is to allow the cost of the upgrade to be attached to the home, not the homeowner. Householders would then only be responsible for the repayments while benefiting from the measures[63] while they live in the property[64].

[63] Source: Department of Energy and Climate Change - Warm Homes, Greener Homes: A Strategy for Household Energy Management www.decc.gov.uk

[64] The trial is not able to demonstrate key aspects of a PAYS approach as government legislation is required to enable a charge to be added to the energy bill. The trial is providing information about how householders react to a PAYS type proposition and how to market it. The five pilots are testing different approaches to partnerships, marketing, billing and delivery mechanism which are being evaluated. The new Conservative-Liberal Democrat Coalition government aims to pass legislation in the autumn to allow the introduction of a full version of PAYS being called Green Deal. Formal Introduction is expected in summer 2012. Green Deal is expected to be a major national financing mechanism for the energy efficiency upgrading of homes and small / medium businesses in the UK beyond this date.

[65] See note above

MARKET-BASED INSTRUMENTS: WHITE CERTIFICATE AND GIS SCHEMES

The white certificate scheme is one of the key new instruments foreseen to support energy efficiency improvements. A (tradable) white certificate scheme complements existing policies and measures and aims to help achieve current or newly formulated energy efficiency targets in a cost-effective way. White certificates have up to now been used in combination with an obligation scheme. Certificates can be created from projects that result in energy savings beyond business as usual, by target market actors or by Energy Service Companies (ESCOs). Certificates received for savings achieved by market actors[66] can be used for their own target compliance or can be sold to (other) obliged parties[67].

- PROS and CONS: Any conclusion on effectiveness of the scheme would be premature. However, it appears to be very effective in decreasing overall carbon emissions.

CASE STUDY: FRANCE

TITLE	White Certificate scheme (CEE)[68]
WHO	The Government
AMOUNT	n/a
DESCRIPTION	The demand for certificates comes from energy savings obligations imposed on energy sellers. The supply of certificates comes from companies or public authorities who undertake actions, beyond their usual activity, aimed at energy savings. Part of the energy supplier's obligations can be fulfilled buying certificates from other operators. Penalty of EUR 2c per kWh missing at the end of the first period[69]. Standardised operations defined (58 on residential buildings). Due to the success of the scheme, the new obligation for the second period of CEE is set at 345 TWh cumac[70] , transport sector included.
INDICATORS[71]	Ex-ante evaluation: - Energy savings target: up to 54 TWh cumac for the first period, from 1 July 2006 to 30 July 2009. Ex-post evaluation: - Energy savings: 84.5 TWh cumac (30 Sept. 2009, 56% above the objective), 127 TWh (31 July 2010). - Total costs of works: c.a. EUR 4 billion[72] (for the first period)

[66] Usually retail energy suppliers or distributors

[67] It should be noted that a white certificate scheme does not necessarily imply introducing the possibility of trading.

[68] POPE law N° 2005-781 (Decree n° 2006-600 of 23 May 2006)

[69] It should start after the adoption of the "Loi Grenelle 2" in September 2010.

[70] Cumulated and discounted

[71] ADEME

[72] Consumers (70%), Government (25%), and Suppliers (5%)

Emissions trading under the Kyoto Protocol allow countries that have international targets and thus emission units (AAUs) to spare to sell this excess capacity to countries with targets that are over their targets[73]. The Central and Eastern-European countries[74] have an estimated 8 to 12 billion surplus of governmental emissions rights (AAUs). Green Investment Schemes (GIS) have been introduced to address the "hot air" situation[75]. Under GIS, revenues from sales of surplus AAUs are invested in environmental improvements in the selling nation, in particular in GHG reduction measures[76]. Improved energy efficiency in buildings provides a prime example of such opportunities. The current Kyoto mechanism JI failed to implement projects in the building sector. Fund allocation of GIS revenues may, for example, be structured through grants, loans, credit guarantees, or equity.

- PROS and CONS: Any conclusion on effectiveness of the scheme would be premature.

CASE STUDY: CZECH REPUBLIC

TITLE	Green Investment Scheme
WHO	The Ministry of Environment (MoE)
AMOUNT	Approx. EUR 960 million raised through AAU sales by October 2009
DESCRIPTION	The priority area is the building sector. It provides for both, soft and hard greening[77], which include building retrofitting. 5% of AAU revenues are used for administrative purposes, 95% for the projects and programmes themselves. Beneficiaries include owners of family houses and apartment buildings. Project lifetime of 15 years. Beneficiaries can apply for the funding upfront, however the money flows after the implementation of the projects or shortly before they are finalised. Projects must be completed within 18 months and have to be finalised before the scheme is closed. Running from April 2009 until mid 2012.
INDICATORS	Ex-post evaluation[78] as of November 2009: - Around 1,800 applications (96% single family houses) - Processed applications total value: around EUR 9.8 million

[73] Article 17 of the Kyoto Protocol

[74] Including Russia and Ukraine

[75] This AAU surplus is often referred to as "hot air", as there is a common connotation that a major share of the corresponding emission reductions has not been reached through planned emission reduction efforts but is primarily the result of the economic downturn in energy intensive industries. Article 17 of the Kyoto Protocol (International Emissions Trading) provides for the sale of surplus AAUs to Annex-I countries that are in need of extra AAUs to comply with their emission targets. However, all potential buying countries have stated that they do not intend to achieve compliance through purchasing "hot air".

[76] GIS only works for countries with surplus AAU

[77] There are two types of "greening" depending on the nature of the greening activities. Hard greening refers to activities in which the greening process directly delivers measurable and quantifiable emission reductions. If the corresponding activities have non-quantifiable and non-measurable emission reductions, this is called soft greening (Blyth and Baron, 2003; Andrei et al., 2006)

[78] Green Investment Schemes: First experiences and lessons learned – Joanneum Research and Center for climate change and sustainable energy policy (April 2010)

ESCOs

An "energy service company"(ESCO) is a natural or legal person that delivers energy services and/or other energy efficiency improvement measures in a user's facility or premises, and accepts some degree of financial risk in so doing. The payment for the services delivered is based (either wholly or in part) on the achievement of energy efficiency improvements and on the meeting of the other agreed performance criteria[79].

The models of offering these services can take various forms and result in diverse contract models and financing arrangements. In fact, the ESCo service package does not automatically need to include financing, which can be provided by the building owner, the ESCo or a third financing partner. In any case, the ESCo can be used as a vehicle and facilitator for financing.

Two basic business models include the "Energy Supply Contracting" (ESC), where efficient supply of useful energy such as heat, steam or compressed air is contracted and measured in Megawatt hours (MWh) delivered, and the Energy Performing Contracting" (EPC), where the focus is on reducing final energy consumption through demand side energy efficiency measures, including technical building equipment, user behaviour and the building envelope insulation. This business model is based on delivering savings compared to a predefined baseline, also labelled as Negawatt hours (NWh).

Reliable market data on national or European ESCo markets are scarce or not publicly available. However ESC projects are dominant products in the residential sector with the actual market coverage between 10% and 20%[80]. On the other hand, the EPC project market share in the ESCo market is only around 10% (including residential) though they have successfully delivered guaranteed energy savings of 20% and above, if properly implemented. Moreover, they are essentially limited to the public sector and spread very unevenly throughout Europe[81].

- PRO: Strong impact on the uptake of energy efficiency by filling the gap between energy specialists and financers. Powerful tools in terms of impact, relevance and clarity. May address some financial barriers (small size project).
- CONS: Cannot perform all roles (auditor, certifier, financier, consultant, etc.). Typically not capable of bearing the financial needs of a full building retrofit.

[79] Directive 2006/32/EC

[80] IEA Annual Report 2009

[81] IEA Annual Report 2009

CASE STUDY: GERMANY

TITLE	Berlin Energy Saving Partnerships
WHO	The City of Berlin in partnership with several ESCO's Project-management by Berlin Energy Agency (BEA)
AMOUNT	EUR 44,078,713 (from ESCOs)
DESCRIPTION	The Berlin Energy Agency manages the Berlin Energy Saving Partnerships, a model for the implementation of energy efficiency measures and retrofit of public buildings. CO_2 reductions with an average of 26 % are the result of the public tenders, which bring together a number of buildings. The ESCO pays for the retrofit upfront and building owners pay them back over an agreed period, usually 8 to 12 years in annual instalments from the energy-cost savings. Typically around 80% of the annual savings are paid to the ESCO, the other 20% are the direct gain of the City of Berlin.
INDICATORS	Ex-post evaluation[82] : - Annual Financial Savings: EUR 11,342,334 of 1,300 buildings - Annual CO_2 Reduction: 67,874 tons - Average energy saving / energy cost savings: 26%

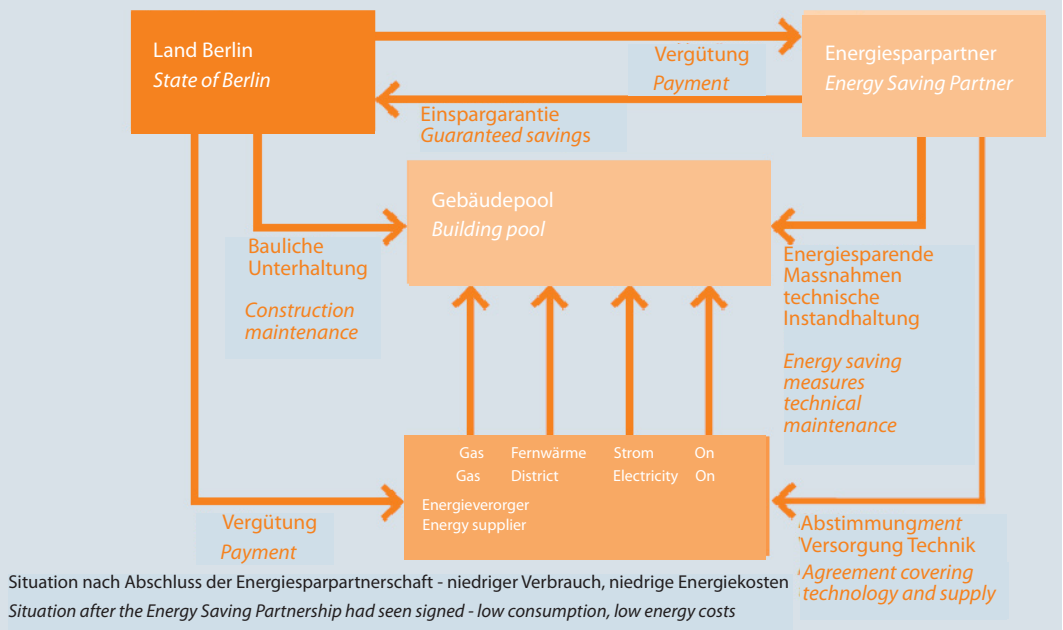


Figure 4. Energy Saving Partnership [83]

Energy Saving Partnerships work because: savings are guaranteed by contract; the reduction of energy consumption in large building complexes or a building pool is made through investments by contractor; refinance the investment through the savings in energy-costs; the building owner participates in the saved costs.

[82] http://www.c40cities.org/bestpractices/buildings/berlin_efficiency.jsp

[83] Source: http://www.berliner-e-agentur.de/index.php?idcat=38

CASE STUDY: AUSTRIA

TITLE	Integrated Energy Contracting (IEC) – "Schloss Retzhof"[84]
WHO	Landesimmobiliengesellschaft Steiermark (State Real Estate Company, Styria) with the support of Grazer Energieagentur Gmbh
AMOUNT	Investment: ca. EUR 110,000 Co-financing by building occupant: EUR 38,000
DESCRIPTION	The Retzhof is a complex of buildings consisting of a castle from the 16th century as well as two seminar and guest houses from 1960 and 2009. Overall useful area of approx. 4,000 m^2. The building owner's goals were: replace the old boiler installation, outsource energy supply and financing of the investments, reduce energy demand and costs through demand side saving measures as well as CO_2 reduction. Central issues: combination of energy efficiency measures (e.g. insulation of upper floor ceiling with inflated cellulose, energy management & controlling) and supply of useful energy (e.g. the ESCo invests in the CHP plant at its own risk). The EPC savings guarantee is substituted with measure-specific quality assurance instruments.
INDICATORS	Ex-ante evaluation: - Consumption indicator amounted to ca. 185 KWh/m2/year Ex-post evaluation: - Final energy savings: ca. 15% - CO_2 reductions: 35% (ca. 100 t/a)[85] - Competitive energy prices: ca. 53 EUR/MWh, equal to 0.8 EUR/m2 month

The Integrated Energy Contracting (IEC) is a new market-based implementation model for energy efficiency and supply[86] based on the well-established Energy Supply Contracting model. It combines both reduction of energy demand through the implementation of energy efficiency measures[87] and efficient energy supply of the remaining useful energy demand, preferably from RES.

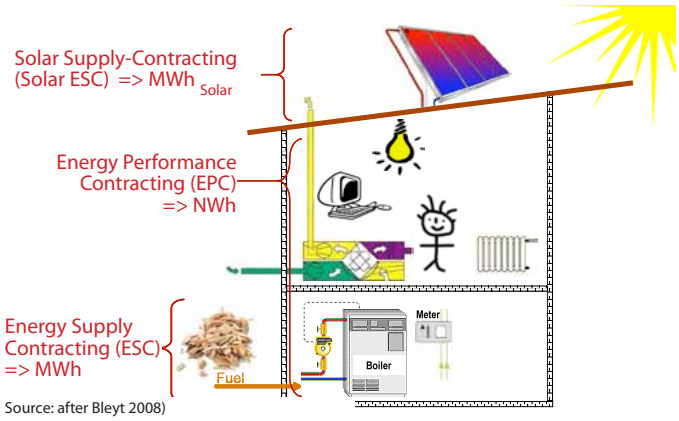


Figure 5. Integrating Energy Contracting

[84] Bleyl, Jan W Integrated Energy Contracting. A new ESCo model to combine Energy Efficiency and (Renewable) supply in large Buildings and Industry IEA dsm Task XVI discussion paper, October 2009, download available on www.ieadsm.org

[85] IEA Annual Report 2009

[86] IEA DSM TASK XVI "Competitive Energy Services"

[87] In the field of building technology (HVAC, lighting), building shell and user motivation

PUBLIC-PRIVATE PARTNERSHIP

In recent years, Public-Private Partnerships (PPP) have developed in many fields. Public authorities at all levels are increasingly interested in co-operating with the private sector when ensuring the provision of an infrastructure or a service. The interest in such co-operation is partly due to the benefit public authorities could have from the know-how of the private sector, in particular to increase efficiency; this interest is partly due to public budget constraints[88].

- PROS: Tend to be sustainable as they tend to foster a genuine market transformation. Flexibility in the tools to be applied by the private sector. Allow more sustainable changes as they allow different barriers to be addressed concurrently and increase the impact of a policy on market transformation[89].
- CONS: n/a

CASE STUDY: THE ENERGY-EFFICIENT BUILDINGS (EeB) PPP

TITLE	The Energy-Efficient Buildings (EeB) PPP
WHO	European Commission, Industry
AMOUNT	EUR 1 billion programme
DESCRIPTION	As part of the European Economic Recovery Plan launched a year ago to address the current crisis, the "Energy-efficient Buildings" initiative is a programme in which the European Commission and industry will support research on sustainable technologies for the EU construction sector. The aim is to develop energy-efficient materials and systems for new and renovated buildings which can help to radically reduce their energy consumption and CO_2 emissions. Besides the horizontal aspects, three major challenges have been identified: (i) Refurbishment to transform existing buildings into energy-efficient buildings (ii) Neutral or energy-positive new buildings (iii) Energy-efficient districts and communities.
INDICATORS	n/a

88 COM(2005) 569 final
89 Promoting Energy Efficiency Investments - IEA 2008

KEY DISCUSSION POINTS

Existing buildings in Europe, especially residential ones, represent a huge potential for energy savings. Taping these enormous potentials represents one of the most significant and most difficult tasks, which can only be advanced in a concerted action, with as many players active in energy policy and industries as possible, as well as the end-users of energy themselves. Numerous barriers in diverse forms remain a significant obstacle to the uptake of more energy efficiency in the residential building sector. Overcoming these barriers will not be achieved by the market alone. Figure 6 surveys potential policy instruments and measures to overcome financial barriers as previously examined in chapter 3.

Buildings category/ Policies instruments and measures		Funding Pro-grammes	Structural Funds	Grants Subsidies Fiscal measures	Preferential loan	Market-based instru-ments	ESCo	PPP
Existing Buildings	Public	x	x	x		x	x	x
	Private	x	x	x	x	x		x
	Tertiary	x		x	x	x		x
New Buildings	Public	x		x				x
	Private	x		x	x			x
	Tertiary	x		x	x			x

Figure 6. Summary of policies instruments and measures

The paper presented common instruments and measures to address the residential building retrofitting financial issue both at European and National level. Many tools are available and each has its unique advantages and disadvantages. Several key questions should be further discussed between different stakeholders, directly and indirectly related to the building sector.

WHICH INSTRUMENTS AND MEASURES ARE MOST SUITED TO ADDRESSING FIRST COST BARRIERS?

Financial incentives and fiscal measures are important in reducing transaction costs and perceived risks, nevertheless it is necessary to account for the "free ridership" issue; Preferential loans specifically target the initial cost barrier; Market-based mechanisms also stand to have a great impact, although optional and in need of development; ESCOs have a strong

transition impact to deliver energy savings and offer a win-win solution to end-users, nevertheless, the decision of the building owner to wish to invest in energy efficiency remains a basic requirement; Public-private partnerships offer vast opportunities to address different aspects of the financial barrier simultaneously. What other types of policies and measures should accompany the financial instruments?

HOW TO PUT IN PRACTICE THE RIGHT MIX OF POLICIES AND MEASURES THAT WILL INDUCE DECISION-MAKERS TO MAKE THESE HEAVY INVESTMENTS IN VIEW OF THE LONG PAYBACK PERIODS?

The financial viability of major projects to improve the thermal integrity of buildings is highly site specific. Even in the best cases, investment payback periods for such projects are usually significantly longer than for efficiency measures in new buildings. And this is true especially if we want to undertake major renovations, with long term benefits, to shadow renovations that risk locking the potential for many years. Perhaps, policy packages that seek to address multiple financial barriers at the same time are likely to be more relevant and may have greater impact.

HOW TO BEST MAKE USE OF EUROPEAN INSTRUMENTS?

Funding programmes are used in many countries to support energy efficient retrofitting projects; European regional policy can have an important impact depending on the individual member states' willingness to introduce projects related to energy efficiency in existing buildings, notably in the new Member States. In the short term, structural funds have a key role to play in greening national and regional spending programs; however appears not to be fully used. Why ? EU is also funding R&D activities at a significant level through E2B PPP. The establishment of revolving funds is a promising option to overcome long repayment period of the projects.

HOW TO CREATE A MARKET FOR IMPROVED EE OF BUILDINGS?

The deep renovation of a huge amount of European buildings, further than its other remarkable benefits such as reducing or eliminating fuel poverty and improving energy security, is expected to have a consistent impact on employment both directly, by the creation of many new jobs in the construction industry, and indirectly on all the sector related services.

In addition, the savings from the reduction of energy consumption will increase the income of the families which, when spent, will generate additional induced benefits to employment[90]. Ambitious major renovation programmes would have the capacity to relaunch not only the construction industry, but to help the entire economic recovery process. Industry and commercial banks should be encouraged to exploit the advantages that such an EE market can offer.

WHO SHOULD DO WHAT?

We have seen examples that have worked and others where it has not. Why? There is perhaps a need to define at country level the role and responsibilities of the various governmental organisations, banks and professional associations. What can IFIs (International Financial Institutions) do at Member State level? Financing is a crucial issue, but has to be seen in the context of a number of policies and measures, ranging from education and awareness to regulations and compliance. The private sector also has to assume a key role and be rewarded for it.

[90] These are referred to as induced effects.

REFERENCES

- Andreas Tuerk, Dorian Frieden, Maria Sharmina, Helmut Schreiber, Diana Ürge-Vorsatz, (April 2010) *Working Paper Green Investment Schemes: First experiences and lessons learned* Joanneum Research, Graz, Austria University of Manchester, UK Central European University, Budapest, Hungary
- ADEME, *Energy Efficiency in the European Union: Overview of the policies and good practices*
- ADEME, (November 2009) *Energy Efficiency Trends and Policies in the Household & Tertiary sectors in the EU 27*
- Association for the conservation of energy, (September 2009) *Working paper: current financial and fiscal incentive programmes for sustainable energy in buildings from across Europe* EUROACE
- California Energy Commission, (January 2000) *How to Finance Public Sector Energy Efficiency Projects*
- Danish Energy Authority (May 2003), *Danish Energy Saving Report - Draft translation*
- Department of Energy and Climate Change *Warm Homes, Greener Homes: A Strategy for Household Energy Management*
- Directive 2006/32/EC of the European Parliament and of the Council of 5 April 2006 on *energy end-use efficiency and energy services* and repealing Council Directive 93/76/EEC
- Directive 2010/31/EU the European Parliament and of the Council of 19 May 2010 *on the energy performance of buildings (recast)*
- ENEA - Gruppo di Lavoro "Efficienza Energetica", (December 2009) *LE DETRAZIONI FISCALI DEL 55% PER LA RIQUALIFICAZIONE ENERGETICA DEL PATRIMONIO EDILIZIO ESISTENTE NEL 2008*
- EURIMA, *BETTER BUILDINGS THROUGH ENERGY EFFICIENCY: A Roadmap for Europe*
- European Commission Directorate-General Energy and Transport, (2009) *Study on the Energy Savings Potentials in EU Member States, Candidate Countries and EEA Countries Final Report*
- European Commission, *EU energy and transport in figures 2010*
- European Commission, (2005) *Green Paper on Energy Efficiency Doing More with Less*
- European Commission, COM (2008) 800 final *Communication form the Commission to the European Council. A European Economic Recovery Plan*
- European Commission, COM (2008) 11 final, Communication form the Commission to the Council and the European Parliament *on a First assessment on National Energy Efficiency Action Plans as required by Directive 2006/32/EC on energy end-use efficiency and energy services*
- European Commission COM (2005) 569 final Communication form the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on *Public-Private Partnerships and Community Law on Public Procurement and Concessions*
- European Commission SEC (2006)1174 Commission staff working document *Accompanying document to the Communication from the Commission Action Plan for Energy Efficiency: Realising the Potential IMPACT ASSESSMENT*
- European Commission, (COM (2006) 545) *Background Information Paper for the Public Consultation on the Evaluation and Revision of the Action Plan for Energy Efficiency*
- European Commission, COM (2006) 545 final *Communication form the Commission Action Plan for Energy Efficiency: Realising the Potential*
- European Commission, COM (2010) 283 final Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Regulation (EC) No 663/2009 establishing a *programme to aid economic recovery by granting Community financial assistance to projects in the field of energy*
- European Commission, European Research Area, Energy Efficient Buildings EeB PPP, (2010) *Energy-Efficient Buildings PPP Multi-Annual Roadmap and Longer Term Strategy* Prepared by the Ad-hoc Industrial Advisory Group

- EUROACE, (January 2010) *Response to the European Commission consultation on response to the Future "EU 2020" Strategy*
- Fraunhofer-Institute, ENERDATA, ISIS, Technical University, Wuppertal Institute, (March 2009) *Study on the Energy Savings Potentials in EU Member States, Candidate Countries and EEA Countries (Final Report)* Prepared for the European Commission, Directorate General Energy and Transport
- Green Alliance, (2010) *Unlocking a low-carbon Europe perspectives on EU budget reform*
- GreenMax Capital Advisors (March 2009) *Lessons Learned from Energy Effiency Finance Programs in the Building Sector* Prepared for the European Climate Foundation
- InoFin, (December 2008) *Guideline on Social Housing Energy Retrofitting Financing Schemes in EU New Member States*
- International Energy Agency, (January 2010) *Implementing Agreement on Demand-Side Management Technologies and Programmes 2009 Annual Report*
- Jan W. Bleyl-Androschin, Daniel Schinnerl, Grazer Energieagentur (November 2008) *Comprehensive Refurbishment of Buildings through Energy Performance Contracting* IEA DSM TASK XVI
- Jan W. Bleyl-Androschin, Grazer Energieagentur Gmbh (October 2009) *Integrated Energy Contracting (IEC) A new ESCo Model to Combine Energy Efficiency and Renewable Supply in large Buildings and Industry* IEA DSM TASK XVI
- KfW Research, (December 2008) *Economic Observer*
- Klinckenberg Consultants, *Investing in Building Energy Efficiency in the Enlarged European Union* EUROACE
- Merrian Fuller (August 2008) *Enabling Investments in Energy Efficiency A study of programs that eliminate first cost barriers for the residential sector*
- Ministry of Infrastructure of the Italian Republic, Federcasa, *Housing Statistic in the European Union 2005/2006*
- OECD/IEA, (February 2007) *Financing Energy Efficient Homes Existing policy responses to financial barriers*
- OECD/IEA, AFD (2008), *Promoting energy efficiency investments Case studies in the residential sector*
- Power House Europe, *BRIEFING ON EU FINANCING OPPORTUNITIES FOR ENERGY EFFICIENCY IN HOUSING* http://www.cecodhas.org
- Regulation (EC) No 397/2009 of the European Parliament and of the Council of 6 May 2009 amending Regulation (EC) No 1080/2006 *on the European Regional Development Fund as regards the eligibility of energy efficiency and renewable energy investments in housing*
- Regulation (EC) No 663/2009 of the European Parliament and of the Council of 13 July 2009 *establishing a programme to aid economic recovery by granting Community financial assistance to projects in the field of energy*
- Robert P. Taylor, Chandrasekar Govindarajalu, Jeremy Levin, Anke S. Meyer, William A. Ward (2007) *Financing Energy Efficiency Lessons from Brazil China India and Beyond The World Bank*
- UK Green Building Council, (August 2009) *Pay As You Save Financing low energy refurbishment in housing Executive Summary*
- World Business Council for Sustainable Development, (2009) *Energy Efficiency in Buildings - Transforming the Market*
- Wuppertal Institute GmbH, Ecofys Germany GmbH, (July 2009) *Energy Efficiency Watch. Final Report on the Evaluation of National Energy Efficiency Action Plans*

WEB SITES

http://www.berliner-e-agentur.de

http://www.cecodhas.org/

http://www.c40cities.org

http://www.eib.org/

http://europa.eu/

http://www.fiec.org/

http://www.iea.org/

http://www.mure2.com/

http://www.odyssee-indicators.org/

http://unfccc.int/