EuroPHit

D4.4_Appraisal guidelines for energy efficient financing for Financial Institutions

Photo © Rockwool

INTELLIGENT ENERGY – EUROPE II

Energy efficiency and renewable energy in buildings

IEE/12/070

EuroPHit

[Improving the energy performance of step-by-step refurbishment and integration of renewable energies]

Contract N°: SI2.645928

Co-funded by the Intelligent Energy Europe Programme of the European Union

TABLE OF CONTENTS

Acknowledgements

This publication is intended as an information for participating financial institutions at seminars on financing of sustainable housing retrofit projects in member states of the EU. It provides an overview of the instruments and the respective promotional programs of the EU to finance the energetic retrofit of buildings. It is based on the reports and information provided by official EU documents and the respective web-pages of the EU, especially the page ***http://www.buildup.eu/financing-schemes*** and further pages linked to it. Parts of the document are copied from those web-pages of the EU, Parts of the document are taken from following EU documents:

- **FINANCING ENERGY EFFICIENCY: FORGING THE LINK BETWEEN FINANCING AND PROJECT IMPLEMENTATION**, Report prepared by the Joint Research Centre of the European Commission, Authors: Silvia Rezessy and Paolo Bertoldi, May 2010, see http://ec.europa.eu/energy/efficiency/doc/financing_energy_efficiency.pdf

- **FINANCING THE ENERGY RENOVATION OF BUILDINGS WITH COHESION POLICY FUNDING**, ENER/C3/2012-415, prepared by Julien Paulou (ICF International), Jonathan Lonsdale (ICF International), Max Jamieson (ICFInternational), Isabella Neuweg (ICF International), Paola Trucco (Hinicio), Patrick Maio (Hinicio), Martijn Blom (CE Delft), Geert Warringa (CE Delft), 14 February 2014
http://ec.europa.eu/energy/efficiency/studies/doc/2014_guidance_energy_renovation_buildings.pdf

Useful contacts and websites, central help desks

EU phone number:	00800 678 91011
Passivhaus Institut:	www.passivehouse.com, mail@passiv.de
IzN Friedrichsdorf	georg.kraft@izn-friedrichsdorf.de

Abbreviations

CEB	Council of Europe Development Bank
CEF	Connecting Europe Facility
CFI	Commercial financial institution
CHP	Equipment
CFI	Commercial financial institutions
DFI	Development Financial Institutions (like EIB, KfW, EBRD)
DG	Departments of the European Commission, Directorate-General
DG REGIO	European Commission, Directorate-General for Regional and Urban Policy
DSR	Debt service ratio
EAGGF	Guarantee and Guidance Fund
EASME	Executive Agency for Small and Medium-sized Enterprises
EBRD	European Bank for Reconstruction and Development, London
ECA	Export Credit Agency
ECCP	European Climate Change Program
EE	Energy Efficiency
EEA	European Environment Agency
EEE-F	European Energy Efficiency Fund
EEPR	European Energy Program for Recovery
EEN	Enterprise Europe Network
EEM	Energy Efficient Mortgage
EIB	European Investment Bank
EIM	Energy Improvement Mortgage
EPBD	Energy Performance of Buildings Directive
ERDF	European Regional Development Fund
ESCO	Energy Service Companies
ESI	European Structural and Investment Funds. the European Regional Development
EU	European Union
EnerPHit	the standards for energy retrofits, based on the Passive House methodolgy and
EuroPHit	the project to implement the EnerPHit standard in the MS of the EU
IEE	Intelligent Energy Europe
IFC	International Finance Corporation
IFI	International Finance Institutions
JASMINE	Joint Action to Support Microfinance Institutions in Europe
JASPERS	Joint Assistance to Support Projects in European Regions
JEREMIE	Joint European Resources for Micro to Medium Enterprises
JESSICA	Joint European Support for Sustainable Investment in City Areas
KfW	Kreditanstalt für Wiederaufbau, Germany
kWh	Kilo-Watt-hour
LGF	Loan Guarantee Facility
LIFE	Financial Instrument for the Environment
LLC	Life of loan coverage
LGF	COSME Loan Guarantee Facility
MS	Member States of the EU
NCFF	Natural Capital Financing Facility (NCFF) LIFE
NEEAP	National Energy Efficiency Action Plans (NEEAPs)
ORP	Overall Retrofit Plan
PF4EE	Private Financing for Energy Efficiency instrument (PF4EE) LIFE
SCF	Structural and Cohesion Fund
SE	Sustainable Energy: energy efficiency and renewable energy
SME	Small and medium enterprises
SPV	Special purpose vehicle

Executive Summary

This guidance gives an overview of financial models available for sustainable energy (SE) efficiency driven projects, opportunities to combine commercial market financing with various grant programmes provided by the European Union.

It also provides guidance to commercial lending institutions on ways to address energy efficiency savings as part of assessing financial soundness of a project. Using the EuroPHit project as an example the guidance illustrates a method of developing a standardised technical criteria for developing finance program for step by step energy efficiency refurbishments.

The overall aim of this document is to broaden the capacity within the commercial financial institutions on sustainable energy initiatives and stimulate confidence to finance domestic retrofit schemes.

The guidelines are drafted by the Friedrichsdorfer Institut zur Nachhaltigkeit (IzN) e.V, supported by the Building Research Establishment Ltd, as a contribution to the EuroPHit Project under the program “INTELLIGENT ENERGY – EUROPE”. More details on this program, and descriptions of all other projects, are available on http://ec.europa.eu/intelligentenergy.

Background

The most viable strategy of building retrofit is a step by step approach of applying the best technologies every time when refurbishment activities are implemented. For each building this requires a lifecycle concept and a long term strategy.

The overall objectives of the EuroPHit project is the promotion of energy efficiency in existing buildings and the reduction of energy consumption and greenhouse gases. This is achieved by a reduction of energy demand of the buildings, reduced consumption of fossil fuels and electricity, use of renewable energies, implementation of refurbishment measures and improved internal comfort conditions in buildings.

The outcome of the EuroPHit project will be a series of exemplary refurbishment plans, along with the construction details for each step, enabling future designing and building teams to gain an understanding of what has been done, and what remains to be done. By this strategy the building owners could find the best feasible and most viable solutions in a step by step approach over long term.

Chapter 2 summarises various barriers faced in sourcing financial investments for sustainable energy (SE) efficiency driven refurbishment of buildings. The barriers include market barriers as well as failures, legal barriers including cases of joint home ownership of residential buildings.

From commercial financial institutions perspective, it has been identified that there is a general lack of:

- energy efficiency finance experience on existing buildings,
- dedicated time and resources to develop capacity and activities in-house;
- Lack of visibility and scale as it often represents a relatively small niche business for lenders;

In addition to the above, from lending viewpoint some of the barriers are:

- High perceived end-user credit risks;

- Difficulties in creating creditworthy financing structures due to low collateral asset value of energy efficiency equipment itself, as the majority of investment costs is to do with high portions of engineering, development and installation costs.
- Cash flows from energy savings are not (yet) conventional revenues in what is still an asset-based culture in financing discouraging commercial financial institutions entry into this market.
- lack of reliable data on energy prices for long term forecasting which prevent the savings calculations for repayment of long term credits;

Chapter 3 outlines market based financial instruments available for sustainable energy investments in buildings.

Although there are national and international financing support via grants, subsidies etc for energy efficiency projects it is generally unlikely to receive 100% of the cost of a project out of public funds. Most projects combine market based finance instruments (loans and equity) with public instruments. The chapter highlights the typical characteristics of energy retrofit projects and recommends ways to assess the financial soundness of a scheme to ensure it is bankable.

The central interest of a lender is simply focused on a sound relationship between investment and operating cost on one side and the incoming future cash flow on the other side. Therefore it is important that energy financing should include the following in the decision-making process for individual projects:

- The base case values have to be well defined in terms of physical units (like KWh) as well as monetary units (€)
- Energy cost savings should be incorporated into lenders' analysis of free cash flow and ability of borrowers and end-users to meet debt service payments;
- Since there is normally no separate accounting for energy savings in an organisation it must be defined how they are measured and how price changes are treated. (For example, what happens if oil or gas prices increase or decrease)
- If debt services have to paid in foreign currency, there must be contingencies for exchange rate fluctuations
- Savings do not always arrive at the same place as the outflows (investment versus operating budget; tenant versus landlord). Therefore it must be clarified that savings are available for debt services or (in the case of rents) landlords can benefit from savings by higher rents
- Energy efficiency related savings and investment required for routine maintenance related upgrade of a structure should be separated. For the energy related part future savings (or the rent increases) are available for debt service, general maintenance or repairs cost can only be financed by a loan if there is a future incoming cash flow.

In addition to the above, lenders also need to consider the level of risks from fluctuations (e.g. technical performance risks, financial risks, length of repayment period) that could happen during operation and securities available in case of problems arising as a result.

Based on the risks identified, a sensitivity analysis, over the life of a loan period, for various scenarios by changing assumptions like income (rent or savings), energy prices, interest rates, leverage, investment cost increases etc will need to be carried out. Overall, this will enable the lender to make a decision on whether to fund the whole project or to adopt a step by step approach.

The chapter 3 also outlines characteristics of each of the schemes listed below, implementation approach, advantages and disadvantages. There are various forms of financial instruments available for energy efficiency retrofit schemes:

- Debt financing, Credit lines, Revolving funds, preferential loans
- Project finance
- Recourse (balance sheet finance/secured) finance)
- EPC and ESCO financing
- Forfaiting
- Leasing
- Vendor financing (equipment supplier/vendor credit)
- Export finance
- Project Bundling and larger projects

Chapter 4 provides an overview of various public funding sources and the type of support available across Europe.

Governments can help to close the financing gaps, catalyse private investment and accelerate energy efficiency market uptake via financial interventions such as:

- Grant programs
- Credit lines and guarantee schemes
- Redemption grants
- EU funding sources (which are usually be provided in the framework of a national programme)
- National and regional schemes for individuals, social/municipal housing, residential and non-residential schemes
- Funding programs run by European Development Financial Institutions (e.g. European Investment Bank (EIB), European Bank for Reconstruction and Development (EBRD), Council of Europe Development Bank **(**CEB) and the KfW Bankengruppe)

A large majority of energy efficiency technologies are commercially competitive, public financing should pave the way for private financing, rather than substitute for it. Development Financial Institutions have an important role in financing and leveraging financing for energy efficiency projects by raising funds in the financial markets and make them available to project proponents by on-lending via commercial banks. As shown in Germany, KfW can also utilise state subsidies to improve the financial conditions of programs and expand their volume. Special purpose credit lines and/or revolving funds may be appropriate tools when there are liquidity constraints in the banking sector or the need to provide long-term credits to finance institutions.

If grants are available to support the implementation of financing programs, such grants can be used:

- for technical assistance to the borrowers (to pay for energy advisors)
- to pay for technical advice on financing of retrofit concepts
- to finance a repayment bonus (redemption grant) to reward the achievement of certain energy efficiency targets (calculated total primary energy demand of the whole building) which should be confirmed by qualified energy advisors
- To reduce the interest rate and soften the loan conditions.

Public financing support would also enable the market investor to go for a more ambitious, more efficient long term solution (”deep renovation”) with eventually higher investment in the beginning (although the life cycle costs might even be lower). They force the applicant to consider the ultimate goal of a refurbishment, even if it is done in steps.

Chapter 5 illustrates how the EnerPHit standard has been used to create a technical criteria for designing a financing program via the EuroPHit project.

Energy efficiency investments are expected to be refinanced by energy savings over the life cycle of the measure. The energy cost savings will help the building owner pay back the loan which is in the interest of the lender. Financing programs should thus focus on cost optimal measures i.e. component qualities (e.g. insulation thicknesses) with the highest net profit over the life cycle.

The aim of the EnerPHit standard is to offer a guideline for cost-optimal components which can result in high energy savings. This will enable lenders to benchmark returns and design a financing program for reducing the energy consumption of existing buildings that can:

- Be suitable for everyone
- Provide long-term financing for energy efficiency investments

Such a predefined standard simplifies the process of setting up rules and requirements for financing programs considerably. In case of a step by step retrofit (as in the case of implementing the EuroPHit standard) a repayment bonus financed from a grant (redemption grant) can be used in connection with loans to reward the borrower when certain efficiency targets of the EnerPhit standard have been achieved.

In addition to setting component level performance, the standard also requires an Overall Retrofit Plan (ORP) covering all the anticipated retrofit stages over long term. To ensure optimal performance on completion, a precertification scheme for stepwise retrofits to EnerPHit (or Passive House) Standard has been developed. Once the first bundle of energy efficiency measures has been carried out and has gone through quality assurance the pre-certificate is issued. Quality assurance can be continued for future steps. After the last step has been implemented and checked, the full certificate can be issued.

Background

Buildings account for nearly 40% of total energy consumption in the EU. With more than 200 million buildings in need of energy retrofits, many will require deep retrofitting if the EU's 2020 targets are to be fulfilled. The majority of the energy is used in heating and cooling. Deep renovation and improving the buildings envelope and applying passivehaus technologies can save over 80 % of the energy requirement of those buildings.

The EU has introduced legislation to ensure that buildings consume less energy. A key part of this legislation is the Energy Performance of Buildings Directive first published in 2002, which required all EU countries to enhance their building regulations and to introduce energy certification schemes for buildings.

The refurbishment of the building stock provides an opportunity to create local jobs, stimulates the economy and at the same time generates national savings. For example, in Germany, the KfW handles the promotional programs on behalf of the Federal Government**.** The programs for energy-efficient construction and refurbishment receive favourable terms through German federal budget funds to provide financial incentives for more energy efficiency in the housing sector. Recent studies show that in Germany energetic refurbishment of buildings is a win-win situation for the home owners, the environment, the economy and the federal budget[1].

The refurbishment of the building stock to high energy standards essentially contributes to the reduction of energy demand and the lowering of greenhouse gas emissions. For the proprietors the energy-saving rehabilitation is for the most part cost-effective when it is incorporated as part of the rehabilitation cycle, in other words combined with already planned modernization measures. The additional demand in the construction sector has a positive effect on employment, which benefits small and medium enterprises (SME) in particular. Within refurbishment projects the construction industry accounts for nearly three fourths of the direct employment effects. This also triggers indirect employment effects through the demand for inputs such as heating furnaces or insulation material in other industries. Investments in renovation are investments in future savings. The person who pays benefits, that is either the home owner who is paying lower energy bills or the government which is stimulating activities and receiving taxes.

Such retrofits can either be done all in one go or incrementally in a step-by-step manner. Step-by-step refurbishment – as proposed by the EuroPHit project - constitutes the most appropriate approach in most cases of energy efficient refurbishment, both from the building perspective (modernization where and when needed) and from the point of view of the house owners with limited resources. Significant reductions in energy consumption have been demonstrated in many successfully completed retrofits. For further information on this project, please visit the webpage www.passivehouse.com.

[1] The current and previous evaluations and studies on the economic impacts are available at https://www.kfw.de/KfW-Konzern/KfW-Research/Economic-Research/Evaluationen/Energieeffizient-Bauen-und-Sanieren/ see Tabelle2 on page 7 of the study

Building retrofits generate energy savings over the lifecycle of the investments, therefore long term financing is needed. Getting finance right is the first step in the provision of the full solution. Financial institutions can help their clients because they have access to low cost capital and grant funds provided by the EU or the local government. Governments can promote retrofit projects by own grant funds. These guidelines shall help Financial Institutions to have a better understanding of the EU funding system and with the design of special financial tools and financing programs. It will also provide the necessary information to present financing proposals to the decision making hierarchy of banks or to apply for promotional refinancing at international promotional banks and the EU.

The Effect of Government Subsidies for Energy Efficiency Investments:

Governments should know that public support creates investments and tax income and contributes to achieve external effects like GHG savings, health improvements etc. For the promotional programs in Germany the following effects have been calculated:

- **Theoretically a 19% subsidy for an investment project can generate VAT incomes for the government. With a 19% VAT it could be budget neutral.**

In addition there are multiplier effects. The Swiss Prognos AG, for example, estimates – in the basic scenario for Germany - the following values: A subsidy fund of 25 Bn Euro creates

- **investments of 428 Bn Euro**
- **tax revenue of 39 Bn Euro**
- **total value added of 80 Bn Euro**
- **energy cost savings of 92 Bn Euro**
- **CO2 reduction of 15,6 Million ton p.a.**

1 The EuroPHit Project

The overall objectives of the **EuroPhit** project is the promotion of energy efficiency in buildings and the reduction of energy consumption and green house gases. This is achieved by a reduction of energy demand of the buildings, reduced consumption of fossil fuels and electricity, use of renewable energy technologies, implementation of refurbishment measures and improved comfort of housing. There are significant non-financial yet material co-benefits delivered through the execution of an optimal energy efficiency retrofit including enhanced health and comfort and improved standards of living. These co-benefits may be as strong, or stronger, drivers of a retrofit than the pure economics. There is a strong correlation between the amount of co-benefits and the relative depth of the retrofit: The deeper the retrofit, the greater the likely positive side effects to the building's occupant and owner.

The EuroPhit project shall help the clients to apply the best available technology when they invest in energy efficiency of their buildings. It aims to

- significantly increase the quality and energy efficiency of step-by-step refurbishments throughout the EU by developing a comprehensive and integrated methodology,
- implement uniform quality assurance of both design and construction, encouraging implementation by key actors and fostering knowledge dissemination through new and existing project networks,
- mobilize financial resources to support the energy efficient refurbishment of the building stock.

The most viable strategy of building retrofit is a **step by step approach** of applying the best technologies every time when refurbishment activities are implemented. For each building this requires a lifecycle concept and a long term strategy. The EuroPHit project will produce exemplary refurbishment plans that anticipate the overall workflow for the step by step retrofit. Using these plans, along with the construction details for each step, future designing and building teams will have a thorough understanding of what has been done, and what remains to be done. By this strategy the building owners shall find the best feasible and most viable solutions in a step by step approach. The EnerPHit standard seeks an optimal investment in different climates and different architectural contexts.

The **EuroPHit** project makes use of and promotes **EnerPHit**, one of the most stringent and integrated standards available internationally for energy retrofits. The **EnerPhit Standard**, in turn, is based on the Passive House methodology and concept, a tried and true approach to efficient building with over 20 years of positive examples to show.

Through a focus detailed planning paired with quality building components, superior insulation, ventilation with heat recovery, thermal bridge free design and airtight construction, Passive House buildings reach high levels of energy efficiency and comfort. Adherence to the strict Passive House criteria result in buildings with superior air quality and comfortable indoor temperatures year round that use up to 90% less energy than the typical building stock, or less than 1.5 litres of oil or 1.5 cubic meters of gas to heat one square meter of living space for an entire year. Vast energy savings have also been demonstrated in warm climates where conventional buildings typically require ac-

tive cooling. Over the last two decades, the Passive House Standard has gained rapidly in recognition and has proven to be a reliable approach in an ever increasing range of climates

Retrofitting with Passive House principles: EnerPHit

Achieving the Passive House Standard in refurbishments of existing buildings is not always a realistic goal, due in large part to unavoidable thermal bridges in the existing structure. Renovations according to Passive House principles are made possible by retrofitting to the EnerPHit Standard. See passipedia.org/certification/enerphit

EnerPHit – the Passive House Certificate for retrofits

It is not always possible to achieve the Passive House Standard (new constructions) for refurbishments of existing buildings, even with adequate funds. For this reason, the PHI has developed the "**EnerPHit** – Quality-Approved Energy Retrofit with Passive House Components" Certificate.

Significant energy savings of between 75 and 90 % can be achieved even in existing buildings, for which the following measures have proved to be particularly effective:

- improved thermal insulation (based on the principle: if it has to be done, do it right)
- reduction of thermal bridges
- considerably improved airtightness
- use of very good quality windows (there is no reason why Passive-House-suitable windows should not be used whenever the opportunity arises)
- ventilation with highly efficient heat recovery (again, Passive-House-suitable systems are highly recommendable)
- efficient heat generation
- use of renewable energy sources

These are exactly the same measures that have proved to be successful in new constructions. A number of examples demonstrating the application of high-efficiency technology in existing buildings have become available in the meantime. The Passive House Institute has advised on the implementation of several projects and carries out measurements in modernised buildings.

To know more about the **EnerPHit-Standard** you can also visit the corresponding section in the Passive House Institute's website: "EnerPHit" - New PHI-Certificate for Refurbishment of existing buildings. Based on Passive House principles, the EnerPHit Standard calls for high quality, energy efficient components. Setting the EnerPHit Standard as the target ensures that both the energy demand as well as the quality is future-proof.

To inform and motivate Financial Institutions (FI) to support the EuroPHit project by own creditlines and promotional finance based on promotional programs of the EU is an important integral component of the EuroPHit project.

2 Barriers to the use of sustainable energy

The EU has identified the following barriers to the use of financial investments for sustainable energies (SE) in buildings including energy savings and renewable energies[2]:

2.1 Market barriers and failures:

- High pre-investment development and transaction costs partially due to small size of projects, esp. in the residential sector;
- Information failure on the part of customers: lack of customer awareness and a very high perceived risk of new more efficient technologies by both users and financiers,
- Mistrust in energy audits, benefits initially invisible;
- Information failure on the side of commercial financial institutions (CFIs): general lack of sustainable energy (SE) finance experience within commercial financial institutions, lack of dedicated time and resources to develop SE capacity and activities in-house;
- Lack of visibility and scale of SE finance: SE projects often represent a relatively small niche business for major banks;
- High perceived end-user credit risks;
- Low collateral asset value of SE equipment and difficulties creating creditworthy financing structures. Collateral value is low because for most SE projects equipment represents a sizeable share of total project cost with high portions of engineering, development and installation costs;
- Energy savings as revenue is foregone by financiers: cash flows from saving energy are not (yet) conventional revenues in what is still an asset-based culture in financing. This discourages commercial financial institutions entry into this market. Energy cost savings should be incorporated into lenders' analysis of free cash flow and ability of borrowers and end-users to meet debt service payments[3];
- lack of reliable long term forecasting regarding the development of the energy prices, which prevent the savings calculations for repayment of long term credits;
- Even where payback periods are short and economic benefits clear, SE projects are often not implemented because of high upfront costs;
- In the rental sector: Split incentives between building owners and tenants;
- In the residential sector: long payback periods, lack of contractors, small project size and lack of support for holistic retrofits.
- All sectors: not considering life-cycle costs in procurement

[2] See: FINANCING ENERGY EFFICIENCY: FORGING THE LINK BETWEEN FINANCING AND PROJECT IMPLEMENTATION, Report prepared by the Joint Research Centre of the European Commission Authors: Silvia Rezessy and Paolo Bertoldi, May 2010, page 2 and 3

[3] EE equipment is highly specific to a certain site or application. High asset specificity implies illiquidity of certain investments, which leads to higher interest rates being required by investors in those investments. Transaction cost economics uses the term “high assets specificity,”, which entails poorer collateral and creates higher risk in that specialized assets cannot be redeployed without sacrifice of productive value. Such assets adversely affect the firm’s ability to borrow because firm-specific assets often cannot be redeployed as collateral for borrowing.

2.2 Legal barriers and Barriers in case of joint home ownership of residential buildings

- Public sector: the rules of public budgeting – including the annual budget cycle and multiannual savings cash flow – make it difficult for public entities to finance energy efficiency investments from savings in energy costs (similar rules exist in large companies); local authorities may have to finance energy efficiency investments from their investment budget whereas the resulting savings are credited to the operational budget;
- Residential, joint home ownership: Ambiguities in the legal standing of joint home ownerships and lengthy and cumbersome decision-making due to a large number of decision makers; In the case of properties which are managed by housing management companies, steps for renovation are only undertaken with great reluctance, especially if the proportion of rented units is very high. Here, better living comfort and yield (profitability from rental) are not always aligned. Statutory regulation of renovation cycles normally do not include energy efficiency investments
- Residential and rental sectors: uncertainties related to tenant-owner issues and building ownership;
- Specific issues arise with blocks of flats with individual owners, whereby owners' associations need to be involved in line with the specific legislation and practices. It should be noted that achieving energy savings in multi-apartment buildings with common heating/cooling systems often depend not only on the overall energetic retrofit of such buildings but also the behaviour of end-users.

For the social aspects of retrofit projects especially in case of retrofit of social housing projects and recommendations to overcome the owner-tenant dilemma see **Annex 6.3.**

3 Market based Financial Instruments for Sustainable Energy Investments in Buildings

The primary financing options available for project proponents to finance energy efficiency of buildings are market based financing instruments, which are ***different types of loans*** (bank loans, forfaiting, leasing etc.) as well as ***equity.*** Since energy efficiency measures are subsidised by many official national and international sources there is also a wide range of financing instruments at preferential rates available (grants, soft loans, repayment subsidies etc.). With down to as low as 1,2% for housing loans in 2015 it is difficult to undercut commercial offers by public financing, so these sources will concentrate on longer maturities, grant loans for higher risks projects or offer grants. These public financing sources will be described in chapter 4. It is recommended to combine market based with public instruments. Since, however, it is normally impossible to finance 100% of the cost of an energy efficiency project out of public funds the knowledge of market based instruments and the philosophy behind bank financing is essential.

Whereas for public supports economic benefits (externalities) play an important role as justification for subsidies, such benefits (like GHG –avoidance) do not play a role for financing. The central interest of a lender is simply focused on a sound relationship between investment and operating cost on one side and the incoming future cash flow on the other side.

3.1 Cash Flow as basis for financing

The basis for financing is the financial soundness of a project. The basis for financial soundness is the cash flow. Cash flow from energy efficiency projects consists of:

Figure 1

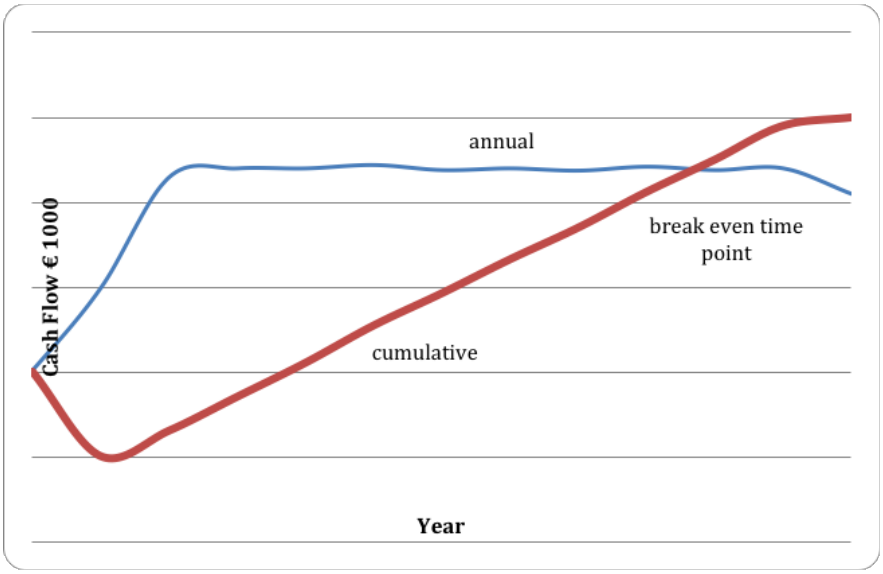
Inflows	Outflows
Savings from efficiency gains	Equity share at investment cost
	Operation cost
Higher rents (house-owners)	Higher rents (tenants)
Loan disbursements	Repayment/interest for loans

Apart from the fact, that all cash flow data are future estimates, investment cost (and equity/debt –share), rent increase, debt services and operation cost can be reasonably well estimated, if necessary, a low and a high scenario can be applied.

Savings are a more complicated issue, as they will arrive as “avoided outflows”. Of course savings can be estimated, but the basis on which it’s measured must be well defined and basis and also affirmation of whether they are readily available for debt service should be clarified. It is important that energy financing should include the following in decision-making process for individual projects:

- The base case values have to be well defined in terms of physical units (like KWh) as well as monetary units (€)
- Since there is normally no separate accounting for energy savings in an organisation it must be defined how they are measured and how price changes are treated. (For example, what happens if oil or gas prices increase or decrease)
- If debt services have to paid in foreign currency, there must be contingencies for exchange rate fluctuations
- Savings do not always arrive at the same place as the outflows (investment versus operating budget; tenant versus landlord). Therefore it must be clarified that savings are available for debt services or (in the case of rents) landlords can benefit from savings by higher rents

Figure 2: Cash flow profile of an energy efficiency project



Characteristics are:

- Long gestation period (break even point after many years only)
- High initial investment cost ("front loaded cost structure")
- High level of uncertainty because of unknown future development (energy prices, technological obsolescence, demand shifts)

Separation of "anyhow cost" and energy related cost:

Quite frequently houses undergoing energy efficiency refurbishment do also need other renovation ("incidental renovation"), for example if the heating system is already 20 years old, the walls need repainting, the windows are close to breakdown and the roof is leaking. Moreover, it is advisable to couple energy saving measures with other, e.g. maintenance measures that are necessary or planned anyhow. For instance, a wall needing a new plastering can be insulated at the same time. In this case, only the additional costs are counted as energy efficiency investment. Energy savings alone can seldom recover total refurbishment cost. A property-owner will also not be in the position to increase rents based on investments necessary for the upkeep of the building. Therefore energy related cost and incidental cost have to be separated.

- For financing it must be clear how these different investment parts are covered by a future cash flow. For the energy related part future savings (or the rent increases) are available for debt service, incidental cost can only be financed by a loan if there is a future incoming cash flow: For the house owner rents (not rent increases) can be used unless there are other repayment obligations, for a public institution or a community part of the budget must be assigned either to serve as equity contribution to the investment cost or to be put aside for the future debt service.

An example of a cash flow analysis of a housing refurbishment project is shown in Figure 3 below (figures are estimates). Due to limitation of space the time frame has been limited to 10 years,

which is enough to show the principle. In many cases, however, the revovery period will be up to 20 years.

Figure 3: Cash flow of a housing refurbishment project

	in 1000 €	C	D	E	F	G	H	I	J	K	L	M	N
	Year		0	1	2	3	4	5	6	7	8	9	10
4	1. Revenue		0	169	169	169	169	169	169	169	169	169	169
5	Renovation rent increase			85	85	85	85	85	85	85	85	85	85
6	Rent increase energy efficiiency			84	84	84	84	84	84	84	84	84	84
7	2. Investment (energy efficiency part)		625										
8	3. Maintenance cost (2% ann. increase)			0,0	6,0	6,1	6,2	6,4	15,0	6,6	6,8	6,9	7,0
9	4. Project Cash Flow (energy)	line 6-8	-625	84,0	78,0	77,9	77,8	77,6	69,0	77,4	77,2	77,1	77,0
10	4a. Project cash flow after tax	line 9-18		83,5	78,0	77,9	77,8	77,2	69,0	75,7	74,9	74,1	73,3
11	5. Equity		125										
12	7. Loan Finance												
13	8. Loan disbursement+debt service	line 14+15	500	70,0	70,0	68,0	66,0	64,0	62,0	60,0	58,0	56,0	54,0
14	8.1 Principal	line 16 * c15		50,0	50,0	50,0	50,0	50,0	50,0	50,0	50,0	50,0	50,0
15	8.2 Interest	4%		20,0	20,0	18,0	16,0	14,0	12,0	10,0	8,0	6,0	4,0
16	Loan Balance		500	500,0	450,0	400,0	350,0	300,0	250,0	200,0	150,0	100,0	50,0
17	Net Cash flow before tax	line 9-11-13	-125	14,0	8,0	9,9	11,8	13,6	7,0	17,4	19,2	21,1	23,0
18	Profit before tax**)			1,5	-4,5	-2,6	-0,7	1,1	-5,5	4,9	6,7	8,6	10,5
19	Profit tax 35%	35%	-125	0,5	0	0	0	0,4	0	1,7	2,4	3,0	3,7
20	Net Cashflow after tax	line 17-19	-125	13,5	8,0	9,9	11,8	13,2	7,0	15,7	16,9	18,1	19,3
21	Plus repayment subsidy 15% (tax free)	15%		7,5	7,5	7,5	7,5	7,5	7,5	7,5	7,5	7,5	7,5
22	Net cash flow after tax+subsidy		-125	21,0	15,5	17,4	19,3	20,7	14,5	23,2	24,4	25,6	26,8
23	Pre Tax financial IRR*)	2,4%		Sensitivity analysis: If additional income 10%:									
24	After tax financial IRR*	1,1%		After tax IRR 9,1%; DSR in year 2 below 1									
25	After tax/subsidy financial IRR*	9,8%											
26	*) refers to equity	**) For profit principal repayment has to be re-added and depreciation (here 10 years) deducted											
27	Debt service cover			1,20	1,11	1,15	1,18	1,21	1,11	1,29	1,33	1,38	1,43
28	Debt service cover after-tax			1,19	1,11	1,15	1,18	1,21	1,11	1,26	1,29	1,32	1,36
29	Debt service cover after subsidy			1,30	1,22	1,26	1,29	1,32	1,23	1,39	1,42	1,46	1,50
30	**Economic IRR**												
31	Total investment (energy)		-625										
32	Project cash flow	line 9	-625	84	78	78	78	78	69	77	77	77	77
33	Total cash flow + repayment subsidy		-625	92	86	85	85	85	77	85	85	85	84
34	Economic IRR*)	4,1%											
35	Economic IRR incl. repayment subs.*)	6,0%											
	*) No externalities included												

Comments on the cash flow table:

Financial Analysis

Lines 4-6: The modernisation and renovation part has been separated from the energy refurbishment part. The table after line 6 shows only the refurbishment cost as well as the estimated income from rent increases. (For other cases it may be replaced e.g. by savings of energy consumption, reduced maintenance etc.)

Lines 7-8: Shows investment cost (€ 625 000) and annual (additional) maintenance expenses

Line 9: Project cash flow (All incoming cash minus all outgoing cash)

Line 11 and 13: It is assumed that the project is financed by 125 000 € equity and a loan of € 500 000. This relation (leverage) is quite important for the financial analysis, whereas it is irrelevant for the economic calculation (from line 30 onwards)

Line 10: Project cash flow after tax: See remarks to line 19

Line 13-15: The loan is assumed to be repaid in 10 equal annual instalment (50 000 each). Interest is calculated on the loan balance (year end). Interest payment plus principal repayment = debt service (line 13)

Line 17: Net cash-flow is calculated by project cash flow minus debt service (line 9 minus 11 plus/minus line 13)

Line 19: Profit tax: For the project the principal repayments have to be added to the net cash flow and the depreciation deducted to arrive at the taxable income. Here a (corporate) tax rate of 35% has been assumed, depreciation is assumed to be spread linear over ten years In reality the tax rate depends also on the overall earnings of the company as well as its status. A public entity may not pay any tax, an ESCO does, depending on the national tax rate. (In the EU between 10 and 38%). So the 35% are more on the pessimistic side.

Line 20: Net cash flow after tax. In line 10 above the tax has to be deducted from the project cash flow (not yet taking into account the debt service. This ratio is needed to calculate the debt service ratio. Equity in cell D 19 is a memory item.

Lines 21-22: A redemption subsidy of 15% of the principal repayments has been assumed (German example). This improves the net cash flow after tax.

Lines 23-25: All internal rates of return (IRR) refer only to the net investment, which is equal to the equity of € 125.000. This explains the very high volatility of the pre- and after tax –IRR.

Lines 27-29: Debts service cover (which should be safely above 1 for a bank finance: In this case it is a bit too close to 1 (years 1-5) for a solid financing and it urgently needs the redemption subsidy. For an improvement (without subsidy) equity could be raised as well as the repayment period could be extended. A scenario analysis should also be carried out for the safety of the project.

Economic IRR:

The economic IRR refers to the entire project cost (€ 625 000) without considering finance (leverage) and taxes. Here no external benefits or cost are considered.

Line 34-35: It can be seen that the economic IRR deviates considerably from the financial IRR.

3.2 Is the project bankable?

One must keep in mind that the cash flow is an estimate of an average development, which may fluctuate into different directions. Banks want to know, up to which extent such fluctuations are possible and therefore they will check the preconditions for such fluctuations as well as the securities in case of problems arising:

1. **Real and perceived technological risk**

   in particular:

   - Quality of design and construction
   - Expected savings will not be reached
   - Novelty of technology and previous experience (is there any experience?)

2. **Financial risk,**

   in particular:

   - Cash flow, debt service ratio and other key ratios
   - Price changes
   - Budgeting of energy cost savings: Are savings recognised as such? How are they booked? Can they be separated from other cash flows?

3. **End-user behaviour affecting energy savings**

4. **Maturity match and country-adapted length of repayment periods:** Maturities are not autonomous, but they depend on the monthly or annual cash flow derived from the project (savings). Since payback periods from energy savings are long, maturities are also long and depending on the country, repayment periods are unusual

5. **Creditworthiness of borrower (private/municipalities/institution etc.) and /or collateral**
6. **Participation of public institutions.**

3.3 Sensitivity and scenario analyses

To judge the actual risk sensitivity and scenario analyses will be applied by changing assumptions like income (rent or savings), energy prices, interest rates, leverage, investment cost increases etc.

Figure 4: Example for a bank ratio (sensitivity) analysis: life of loan coverage

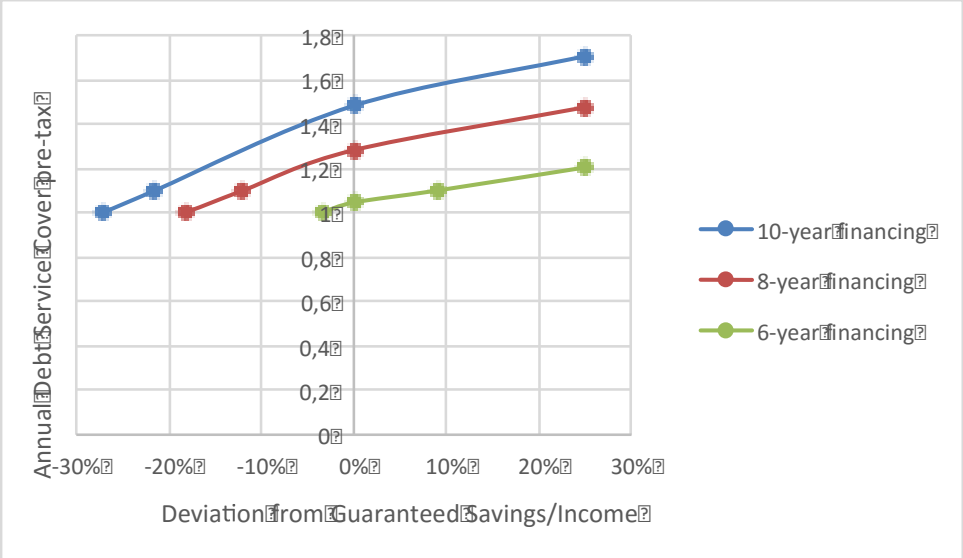


Figure 4 shows an example for a sensitivity analysis of the life of loan cover (LLC). The life of loan cover equals the ratio between the net present value of income/savings divided by the residual loan in the respective year. It shows to which extent the remaining loan is covered by the present value of the cash inflows and it should be above 1.

In figure 4 the relation between different repayment schedules for the loan and deviation from the expected savings can be seen. With a six year repayment period the LLC is already touching 1 with a deviation of only -3% of expected income, which is very unsafe, whereas with an extension of the repayment period the LLC a critical value of “1” will only be reached if the savings are more than 25% beyond expectation. Similar analyses can be carried out with debt service ratio and more influence factors like energy prices, interest rates or efficiency factors can be analysed. It should be noted that it makes no sense to cumulate negative expectations, because such a pessimistic approach will definitely lead to negative results. Such an analysis, however, can open the eyes for the most influential parameters, which have to be taken care of: In case an investment appears to be too risky, a step by step approach might be chosen

3.4 Financial instruments for energy efficiency investments in buildings

3.4.1 Debt financing, Credit lines, Revolving funds, preferential loans

A conventional bank loan is the simplest form of debt. It is an agreement to lend a principal sum for a fixed period of time, to be repaid by a certain date and with interest calculated as a percentage of the principal sum per year and other transaction costs. Soft loan or preferential loan schemes are a mechanism whereby public funding helps to reduce the cost of loans disbursed by financial intermediaries such as commercial banks. The loan configuration varies depending on the borrower/lender and the type of measures to be undertaken. However actual pay-back time is usually taken into account in the loan.

Main characteristics

- Loan maturity usually matches the actual pay-back time of SE projects in buildings. Depending on the type of measures financed, loan maturity may vary from 5, 10 or 20 years.
- Interest rates vary across debtors, banks, long or short terms, regions etc. Currently they range from 1% to 5%. Typically, the interest rate will be fixed over a certain period of time and will be capped to a maximum throughout the course of the loan.
- Corporate or project loans can be done under recourse or limited recourse structures (see chapters 3.4.2 and 3.4.3).

There are two main methods of repayment:

- ***Constant ("bullet") principal repayment***, which means that the repayment is a fixed percentage of the original debt (as in Figure 3): € 50.000 each year). In this case, interest is calculated on the remaining amount, meaning that interest payments (and also total debt service) are declining each year (as in Figure 3) from 20.000 to 4.000). Since the debt service is highest at the beginning, the bullet method is often disadvantageous for private house owners who are normally financially tight at the beginning and who prefer to have an equal yearly or monthly payment.
- The second method is **annuity repayment**, which means that the annual principal repayments are calculated in way that interest plus principal repayment always add up to the same yearly (or monthly) amount, The formula is:
- $A = C \cdot \frac{i \cdot (1+i)^t}{(1+i)^t - 1}$; A= Annuity; C=Total debt; i= interest rate; t=repayment period [4].
  In case of the example in Figure 3 (A=500.000; i=4%; t =10 years) the annual payment (annuity) would amount to: $A = 500.000 \cdot \frac{0{,}04 \cdot (1+0{,}04)^{10}}{(1+0{,}04)^{10} - 1} = 61.645{,}47$. In contrast to the bullet repayment (70.000 in the first year) this is lower in the first six years, but higher in the last four years.

[4] The repayment period t can be annually, semi-annually, monthly or any other period of time. The interest rate i, however, has to be adapted to the period used.

- Grace periods are periods at the beginning without any repayments, but only interest payments. This can also facilitate the financial burden at the beginning, but on the other side the entire repayment period will be extended or the debt service has to be increased

Credit lines will be granted for smaller projects of similar character up to an agreed overall amount. The advantage for the borrower is that the loan approval process will be carried out only once for the first one of similar projects as far as the limit of the credit line is not exceeded. ***Revolving loans*** are similar, but the first loan for the first project(s) has to be partly or fully repaid to open the possibility of financing for a follow up project.

Frequently SE-financing from commercial banks is combined with ***preferential loans***. These are loans or sometimes grants from national or multinational institutions (see chapter 4) handed out at preferential conditions, i.e. lower interest rates, longer maturities, repayment subsidies or even grants in exchange for fulfilling certain conditions, mostly the achievement of pre-defined efficiency values.

In Germany the KfW has subsidised housing renovation for many years. KfW finances itself at low rates on the capital markets thanks to its AAA rating and the guarantee of the Federal State. KfW receives a subsidy from the government to lower the interest rate at which it lends to commercial banks, which can thus offer loans to homeowners at below market rates.

3.4.2 Project finance

Project finance, non-recourse-finance or cash-flow related funding – refers to transactions whereby the project is financed largely based on its own merits rather than the balance sheets of the project sponsors. There are two basic types of project finance, which are often combined: Pure ***cash flow related finance*** will only take the future cash-flow as security, whereas ***secured debt finance*** is additionally safeguarded by all of the project assets, including the revenue-producing contracts. Project lenders are given a lien on all of these assets, and are able to assume control of a project if the project company has difficulties complying with the loan terms. When making a secured loan, banks evaluate both the ***quality of the borrower and the collateral***, but the centre of interest is the cash flow and the question, whether the cash flow generated will be sufficient to cover the debt-service (interest plus repayment). No bank is really interested to go through tedious procedures of a foreclosure and therefore collaterals will only serve as a solution of last resort. Therefore ratios proving that the cash flow is sufficient to cover the repayment are very common in project finance, mainly:

- Debt service ratio DSR (Net-cash flow/debt service) >1;
- Life loan (coverage) ratio LLC:(net present value of cash flow available for debt service/ / outstanding/debt in the period) > 1, at all times
- Leverage: Depending on the creditworthiness of the borrower and the project equity requirements will be higher or lower. A leverage of 80% (loan to total capital) and 20% equity is often considered as the upper limit for loans, more usual are leverages around 70%, in critical cases lower.
- Debt service ratios and leverage are depending on each other to a certain extent: A low DSR can be raised either by a longer repayment period or by a lower leverage (higher equity)

In ***SE project financing*** above a certain threshold there are two common models of third-party financing. One is direct lending to the end-user and another is lending to the ESCO (see chapter 3.4.4). When the end-user is the borrower, then end user credit risks are separated from project performance and project technical risks: the financial institution assumes the end-user credit risk, while all technical and performance matters are addressed between the ESCO and the end-user. The loan, however, is on the balance sheet of the end-user. Loan financing can be combined with savings guarantees from the contractor.

A **bond** is a debt security, in which the authorized issuer owes the holders a debt and, depending on the terms of the bond, is obliged to pay interest (coupon) and/or to repay the principal at a later date, termed maturity. Thus the *issuer* is the borrower (debtor), the *holder* is the lender (creditor), and the *coupon* is the interest. An example of bond financing relevant to energy efficiency is ***issuing municipal bonds in procuring funding for municipal energy efficiency***.[5] Bonds, however, are mostly issued for the borrower as an entity (which is recourse financing, see chapter 3.4.3), whereas a project has to have a certain minimum size as well as a separate project company to qualify for bond financing under the name of the project.

3.4.3 Recourse (balance sheet finance/secured) finance:

In recourse finance a loan is granted on the basis of the creditworthiness of the investor (mostly supported by a collateral). Cash flow and NPV are (for the bank) of secondary importance. It is assumed that the investor knows the cost benefits of the project, but it also depends on the creditworthiness, the experience and the credit rating of the borrower whether or not a bank will request information on the project cash-flow.

Because smaller companies may not have sufficient internally generated cash flow or the debt capacity to borrow easily for general corporate purposes, they often turn to secured debt by offering collateral such as inventory and receivables or property, plant, equipment, or sometimes a bank letter of credit. Pledging collateral may allow such companies obtain bank loans when they would not normally qualify for unsecured loans. The collateral is used to reduce a bank's loss in the event of a default on the loan. Secured loans, however, can only be obtained up to a certain percentage of the company's asset values, which means that service oriented companies with little assets like ESCOS must often use the equipment provided to their customers as collateral. For private house-owners as well as proprietors of apartments the bank will normally look at the income either from the house-owners job or from the proprietors rent-income.

3.4.4 EPC and ESCO financing

An energy performance contracting (EPC) arrangement is an integrated contract in which a contracting partner (such as an Energy Service Company – ESCO) designs and implements energy

[5] The city of Varna in Bulgaria issued municipal bonds to obtain financing for an EE project involving retrofit and modernization of the city's street lighting. The bonds raised 3 million Euro, and the simple payback of the project was 2 years and 9 months. The municipality collected relatively high volumes of financing by issuing general obligation bonds at 9%. Repayment of the bonds was done in three equal portions during a three year period, primarily as revenue bond emission through the savings. Six other cities participated in issuing bonds to raise funding for their projects.

conservation measures with a guaranteed level of energy performance for the duration of the contract. The energy savings are used to repay the upfront investment costs, after which the contract usually ends.

EPC (Energy performance contracting) refers to the contractual arrangement between the provider of energy services and the customer (beneficiary)

ESCO-Energy service company: “Natural or legal person who delivers energy services or other energy efficiency improvement measures in a final customer’s facility or premises” *(Energy Efficiency Directive (EED, 2012/27/EU)*

Main characteristics:

- Under an Energy Services Agreement the contractor provides a performance guarantee, while the end-user pays fixed monthly payment to amortize the investment.
- Payment for services delivered is based (either wholly or in part) on the achievement of EE improvements and on meeting the other agreed performance criteria.
- The contractor and client can split the technical risk in accordance with a pre-arranged percentage by introducing a shared savings scheme in the contract.
- Typical EPC contract terms amount to 10 years but can reach 15 – 25 years.
- Depending on the resources of the ESCO and on the market demand, ESCOs may finance projects themselves or help secure funding by providing performance guarantees.
- ESCO financing structures can employ project finance-type debt, usually with additional collateral or credit support.

Implementation

- Depending on the implementation model, the contracting partner to implement the measures is either a general contractor (GC), a general planner (GP) or an Energy Service Company (ESCO)
- In an EPC, investments can be financed by the building owner, by an ESCO or by a financial institution (Third-Party Financing - TPF), either directly or, more generally, through a combination of financial products (equity, loan, grant, incentive scheme, etc.).

Advantages:

- EPC guarantees a certain level of energy savings and shields the client from any performance risk.
- The ESCO has knowledge of technical requirements, permit legislation and support schemes.
- Enables facility upgrades to be paid for immediately, bringing forward future energy and operational savings.
- Low interest financing options are often available, including tax-free municipal leases.
- The ESCO represents a single point of accountability, simplifying the upgrade process significantly.
- Annual energy savings can be measured and verified according to the International Performance Measurement& Verification Protocol (IPMVP).
- Allows organisations to disconnect project debt from the building owner.

Disadvantages

- EPC is a complex arrangement - establishing an EPC is time-consuming and requires (external) expertise since each project needs to be assessed individually to estimate potential savings.
- Any failure or shortfall from the expected result requires reconciliation to recover shortfall.
- ESCO by itself is not yet a financing solution. Depending on the share of hardware/equipment to be installed upfront there is still a financing problem for the ESCO which might also affect the customer
- Small ESCOs as well as ESCOs with a high volume of mandates will have problems to finance a high share of equipment and will therefore either come back to project finance or to forfaiting, which will involve the customer
- EPCs have relatively high transaction costs, especially when they address the building envelope. As such, they are mainly suitable for large scale or bundled projects due to their complexity.

Measurement and verification (M&V): while the contact is running, the results (energy saved) need to be continuously monitored: this can also be advantageous for the investor if there is no proper accounting for the energy savings.

ESCOs tend to focus on “low hanging fruit” options that have shorter paybacks and a lower risk exposure. However, properly modelled FIs can de-risk the EPC and motivate ESCOs to take longer term engagements, going closer to deep renovation, in particular in the public sector. When the ESCO borrows, it effectively packages together financing with turnkey project implementation and services agreement. In this case the financier has to evaluate not only the end-user credit risk, but also project economics, project engineering and technical performance ESCO financials and equity contribution, ESCO management and performance track record, and all project contracts including the Energy Services Agreement. The loan is on the balance sheet of the ESCO and the ESCO is exposed to the end-user credit risk unless forfaiting is used.

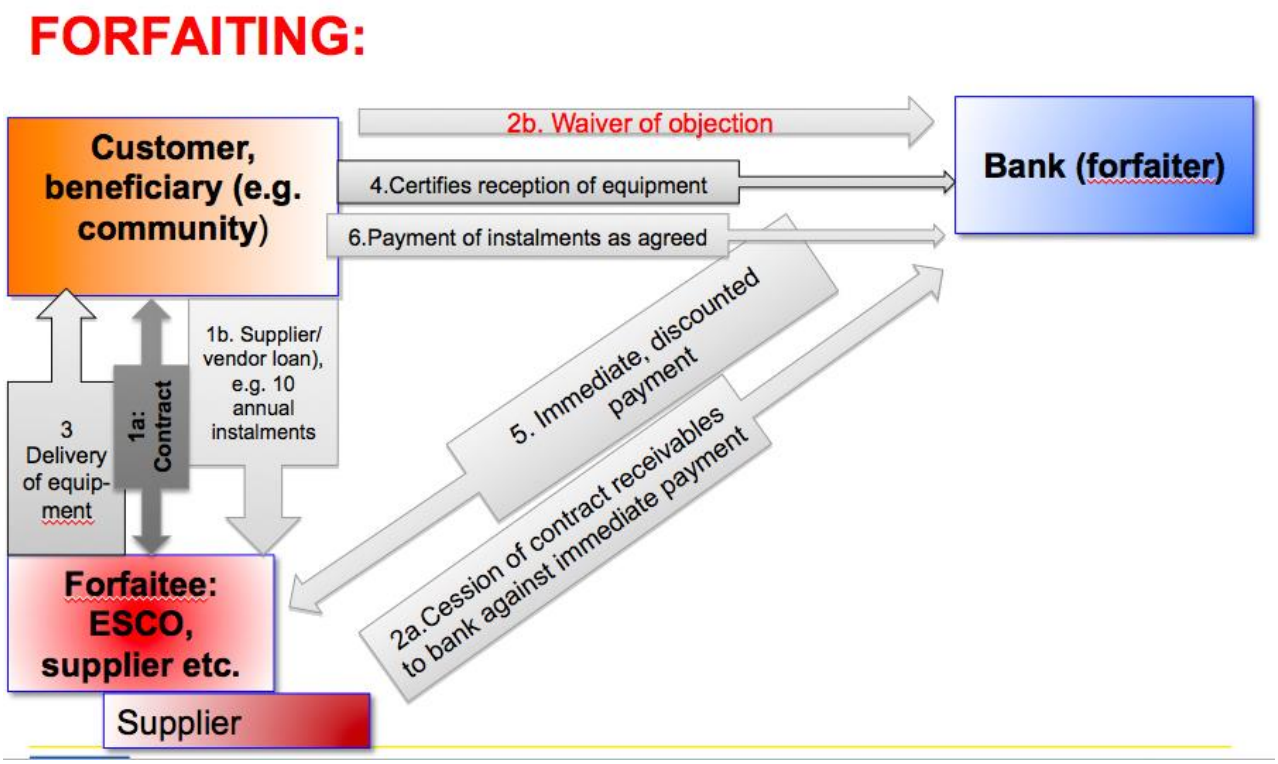
3.4.5 FORFAITING

Financing á forfait means basically

- Selling a receivable for a discounted lump sum to a bank (forfaiter), normally on the basis of bills of exchange
- Example: A sum of € 1 Million in 10 annual repayment instalments, discounted at a forfaiting fee of 4% annually yields an immediate payment of € 880.000 (minus around 0,25% provision fee etc.)
- Passing on all accountability from the financial obligation, meaning: There is no more financial obligation from the side of the seller of the receivable (Supplier or ESCO) in case of breach of contract, non fulfilment etc.
- This “abstractness of the forfaiting document” will be further emphasised by a “waiver of objection”, which means the customer waives his right to object legally against his repayment obligation because of any dispute (like non fulfilment of conditions, late delivery, warranties etc.)
- Forfaiting can be used when an ESCO is in an energy performance contract (EPC) arrangement with an end-user and the ESCO sells future receivables (e.g. the end-user

payments) to the bank. The bank then assumes the credit risk, in return for a discounted one-time payment

Figure 5: forfaiting:



- (1a) Customer and supplier (or ESCO) conclude a contract for the delivery of hardware or the refurbishment of a building on a turn key basis. In the case of an ESCO there will also be a maintenance agreement, which is usually not part of the financing, because maintenance fees can be paid immediately
- 1b. Both parties conclude also an agreement on the terms of payment on a vendor loan basis. (e.g. 10 equal annual payments). These payment obligation of the customer can be (and is usually) supported by signing ten drafts or bills of exchange to facilitate a later cession. The bills of exchange will be, apart from the forfaiting agreement, the legal basis of the claims
- 2a Cession of the claims to a (forfaiting) bank. This will often be a specialised forfaiting bank and not the customer's regular bank.
- 2b The customer signs a "waiver of objection", stating that there will be no claim of refusing any payment because of unfulfilled contractual obligations (in other words: the customer cannot withhold any payment to the bank because the supplier/ESCO has not reached the guaranteed savings)
- 4 and 5: Immediately after reception of the hardware or the completion of the refurbishment works (as stated in the agreements) the bank pays the discounted sum to the supplier/the ESCO.
- 6: The customer re-pays the instalments as agreed in the vendor loan agreement to the bank. There is no interest, because the disbursed sum has been discounted already. The

customer, however, pays back the original sum as stated in the vendor agreement and not the discounted sum (e.g. in the above example the supplier/ESCO would receive € 880.000, but the customer must pay back 10x € 100.000 = € 1 Million

- The ESCO or equipment vendor may provide a performance guarantee, which can serve as a replacement of the waiver of objection.
- Preferably the equipment installed should be owned by the customer, especially if it serves as a collateral
- A separate maintenance agreement between the ESCO and the end-user ensures that the ESCO performs maintenance of the system and the end-user pays fixed monthly payment in return for this service.

Advantages of forfaiting

- One of the main advantages of forfeiting is the availability of immediate cash flow for financing an EE project.
- Payments are made from the end-user directly to the bank, an advantage for the ESCO as ESCOs are often unwilling to maintain EPC financing on their balance sheets.
- Cost are reduced if the end-user's creditworthiness is better than that of the ESCO.
- For the contractor (the ESCO) : The debt is not booked on his balance sheet, so the potential for further debts remains unlimited
- Forfeiting can be used in situations where the end-user has a better creditworthiness than the ESCO or equipment vendor.

Disadvantages of forfaiting

- Often transaction costs of setting a forfeiting contract are said to be high. This is not necessarily the case, but depends on the creditworthiness of the ultimate debtor (the forfaitee) as well as the country. Using forfaiting banks in a low interest country can be cheaper, but one must take note of a potential exchange rate risk
- The waiver of objection poses the problem that the investor cannot stop the payments any more if contractual obligations are not reached (This can, however, avoided if the operational part is separated from the investment part. Operation cost normally need no financing.)
- In many cases, especially with smaller projects, the cash flow generated is not enough to serve as collateral.
- Forfaiting needs immaculate creditworthiness of the debtor and/or the project (otherwise it becomes expensive or impossible)
- Forfaiting documents can be sold on by the forfaiting bank worldwide, so the ultimate repayment might have to be effected to a yet unknown institution.

3.4.6 LEASING

Leasing is a common way of dealing with the initial cost barrier. Leasing is a way of obtaining the **right to use an asset** (rather than the possession of this asset). In many markets finance leasing

can be used for EE equipment, even when the equipment lacks collateral value. Leasing companies, often bank subsidiaries, have experience with vendor finance programs and other forms of equipment finance that are analogous to EE.

There are essentially two main types of leases: ***capital lease*** and ***operating lease***. Under a *capital lease* a lessee is required to show the leased equipment as an asset and the present value of lease payments as debt on its balance sheet. *Operating leases* are not capitalized on a company's balance sheet and lease payments are treated as an expense for accounting purposes. The period of contract is less than the life of the equipment and the lessor (investor) pays all maintenance and servicing costs. Leasing is the most common form of equipment manufacturers' vendor financing.

Leasing is a suitable option for projects where physical assets - rather than labour or services - form the bulk of the expenditure, and where, in the event of default, the ultimate owner may be denied continued use of the asset. As the transaction costs involved in leasing on a small scale would be high and there would be greater risk for the lender and cost for the borrower, leasing is not suitable for projects with a low component of physical assets, such as small-scale retrofitting projects in buildings. Leasing works best with simple equipment and large quantities of sales or installations. Leasing, especially operating leasing is also not really a good solutions for goods that cannot be returned without high cost for de-installation: therefore leasing will be the exception for housing retrofits.

Leasing FIs are generally more prone to base debt service on project cash flow. On the other hand lessors generally require comprehensive insurance packages and operation and maintenance guarantees for equipment, which implies additional cost for borrower

Leasing (in particular cross border leasing) reached some positive (as well as negative) reputation on the basis of tax saving models. Contracts, however, are complicated, sometimes tricky and therefore such solutions are not recommended without the advice of experienced (and expensive) international tax experts and lawyers.

3.4.7 Vendor financing (equipment supplier/vendor credit)

In order to support their marketing efforts, many general equipment manufacturers have established either captive or third-party vendor financing relationships. Vendor financing helps the manufacturer sell its product by facilitating financing of a customer's purchase. Vendor financing occurs when a financier provides a vendor with capital to enable them to offer "point of sale" financing for their equipment. Leasing is a very frequent form of vendor financing.

Under a vendor financing scheme there are two types of arrangements: one between the vendor and the financier; and the other between the vendor and the customer. The former defines the terms that can be offered to the customer such as rates, length of term and necessary documentation. The vendor/customer agreement defines the repayment terms of the loan. For energy efficient equipment these agreements can be structured such that the customer payments are lower than the value of energy savings associated with the new equipment.

If vendor financing is done by a third party, that party has typically done the work necessary to become comfortable with the technical aspects of the product as well as its collateral value. An example of vendor financing was the OTP Bank-Tivi street lighting program in Hungary. IFC has a Guarantee Facility Agreement (GFA) with OTP supporting loans to small and medium-sized mu-

nicipalities to acquire turnkey street lighting system retrofits. A vendor finance program was successfully implemented with Tivi, a company specialising in municipal street lighting. The OTP facility provided financing on a series of Tivi projects, using a fixed payment energy services agreement vendor finance structure.

Because equipment finance increases the vendor's sales and profits, the equipment *vendor* has an interest in supporting the financing. This can take the form of direct recourse, limited or partial recourse, or repurchase or remarketing of equipment in default and repossession events. Utilities can be important partners or originators for EE equipment loan financing. If the utility can perform collections of finance payments via energy bills, the credit structure of the loans will be enhanced.

3.4.8 Export finance

A related kind of vendor financing is export financing, if goods and services are sold by a supplier abroad. There are two main types: export financing which works exactly like ***vendor financing*** with the only difference that two countries and possibly two currencies are involved. The second type is ***buyer financing***: in this case the bank, which is normally located in the exporter's country, will disburse the loan to the exporter, but the obligations from the loan are taken over by the buyer. Economically this type is similar to forfaiting, because the original claim is also transferred, however without the abstract character of forfaiting. Objections because of non-fulfilment of contractual obligations are possible. Export and buyer financing can also be supported by export insurances like Euler-Hermes in Germany or Coface in France.

For short term vendor credits (up to two years) there is also the possibility of using ***letters of credit***, although this will be the exception for the long term types of projects in efficiency investments for buildings. The disbursement on the basis of a letter of credit can also be tied to the fulfilment of certain obligations like obtaining a certificate on having reached a certain standard of energy savings.

3.4.9 Project Bundling and larger projects

Successful **project bundling (pooling/aggregation) strategies** can help to overcome many of the key barriers. Achieving scale is a critical issue for any new business but is particularly acute in the EE finance marketplace, which is characterized by a large number of small projects. To achieve sufficient scale, a strategy is required that allows for the aggregation of individual projects, technologies, service offerings, and investments into a larger and more cohesive combination of opportunities, which would be interesting for ESCOs financial institutions. As demonstrated by the uptake of energy performance contracting in Germany and Austria, targeting public institutions and facilities for large-scale retrofit programs can kick-start market activity. In the residential sector, housing associations – backed by legislative rules that give them sufficient statutory powers – are important actors.

For a higher financing volume see the sections on ***Equity financing, Subordinated Debt financing (mezzanine finance) and Project financing*** *in the EU document FINANCING ENERGY EFFICIENCY: FORGING THE LINK BETWEEN FINANCING AND PROJECT IMPLEMENTATION pages 13 to 18* http://ec.europa.eu/energy/efficiency/doc/financing_energy_efficiency.pdf

3.4.10 Other Financing Tools

'Wholesale' financing instruments

Development Financing Institutions (DFIs) – often in cooperation with national governments – provide framework facilities that extend **credit lines** to local financial intermediaries for on-lending to private person and enterprises for investments in energy efficiency in certain sectors. Credit lines may be combined with a grant component targeting end-borrower investment grants and administration fees for participating banks (see the implementation of EU programs via EIB, CEB, EBRD and KfW).

Pooled procurement

Pooled procurement refers to procurement by public or by private entities joining forces in procuring energy efficient products or services related to improving the energy performance of new and renovated buildings, purchasing energy efficient office equipment and more efficient vehicles.

4 Public supports

Governments can help to close the financing gaps, catalyse private investment and accelerate energy efficiency market uptake via financial and non-financial interventions. However, given that the large majority of sustainable energy (SE) technologies are commercially competitive, public financing should pave the way for private financing, rather than substitute for it. Development Financial Institutions (like CEB, EIB, EBRD and KfW) have an important role in financing and leveraging financing for SE projects because they can raise funds in the financial markets and make them available to project proponents by on-lending via commercial banks. As shown in Germany, KfW can also utilise state subsidies to improve the financial conditions of programs and expand their volume. Special purpose credit lines and/or revolving funds may be appropriate tools when there are liquidity constraints in the banking sector or the need to provide long-term credits to finance institutions. A guarantee scheme or other risk mitigating tools may be appropriate in case of high upfront costs of SE investments (see **Annex 6.1**).

4.1 Grant programs

Grant programs are provided by the EU and state governments to support the upfront cost of innovative energy efficiency investments that may entail long amortisation periods like retrofit of buildings. Investment subsidies increase the financial rate of return on investment. In addition, investment subsidies improve cash flow and thus increase investors' access to debt finance. **Public grants** programs are used in all Member States (MS) of the EU – though to a different extent – in order to support SE projects that contribute to energy and social policies and meet other public policy goals, such as increased employment. The publicly-backed grant schemes introduced at the national level vary a lot in nature – some MS targeted the residential sector with investment subsidies in the form of grants (or even low-income households only). In new MS a strong focus has been placed on grants targeting existing residential buildings, in particular panel multi-family buildings. The advantage of public grant programs is that, provided the subsidy level is sufficient to attract the building owners, subsidies can be an important factor in raising the general awareness and trust in SE projects. Comprehensive program packages are needed where public grant programs interact with other financing schemes deployed by public and commercial FIs in order to increase the investment volume.

4.2 Credit lines and guarantee schemes

Credit lines and guarantee schemes for sustainable energy (SE) are available in a number of countries. In some Member States credit lines and guarantee schemes have typically been established by the Development Financial Institutions, such as the CEB, EIB, EBRD and KfW, targeting energy efficiency projects implemented by local authorities, and legal persons.

In case of a step by step retrofit (as in the case of the EuroPHit project which implements the EnerPHit standard) a repayment bonus financed from a grant (**redemption grant**) can be used in connection with loans to reward the borrower when certain efficiency targets of the EnerPhit standard have been achieved.

Preferential soft loans are commonly used for energy efficiency measures. Loan conditions include:

- Extended payback periods, low or zero interest rates,
- Short-term interest deferral periods, and/or
- Inclusion of payback grace periods.

4.3 Redemption Grants, the example of KfW, Germany

In Germany the energy standards are laid out in the Energy Conservation Ordinance (Energieeinsparverordnung/EnEV). These standards apply to **new buildings**. KfW promotes the refurbishment of houses if after refurbishment they do not exceed a specific energy requirement for a comparable new house. The KfW successfully used redemption grants in their promotional programs for the energetic retrofit of residential buildings. The redemption grants are refinanced out of the government budget. KfW has defined five levels of support for a "KfW Efficiency House" in the building stock:

- KfW Efficiency House 55
- KfW Efficiency House 70
- KfW Efficiency House 85
- KfW Efficiency House 100
- KfW Efficiency House 115

Simply put, the figures indicate in per cent how much of the maximum primary energy requirement for the whole building specified by the EnEV the house consumes. The best standard (55) receives the highest support. The repayment bonus means the borrower has to pay less. The bonus depends on the level of energy efficiency achieved. The achieved level of energy efficiency (total primary energy demand) has to be confirmed by an energy performance certificate issued by a registered energy advisor. The grant is transferred to the account of the borrower after completion of the refurbishment measures.

- 17.5 % of the loan as a repayment bonus for a KfW Efficiency House 55/Passivhaus
- 10.0 % of the loan as a repayment bonus for a KfW Efficiency House 70
- 5.0 % of the loan as a repayment bonus for a KfW Efficiency House 100

- 2.5 % of the loan as a repayment bonus for a KfW Efficiency House 115
- 2.5 % of the loan as a repayment bonus for a KfW Efficiency House Monument

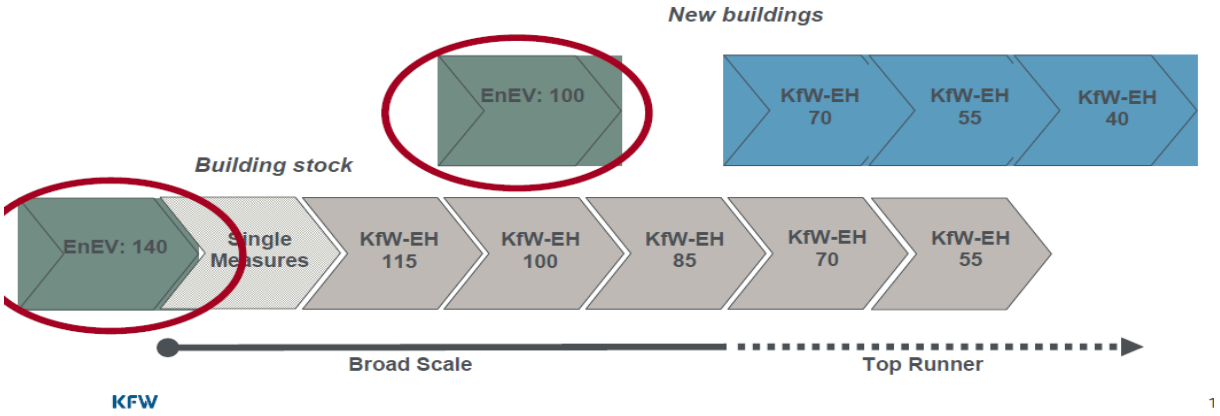


Figure 6: KfW promotion of energy efficiency in buildings (**EnEV = Energy Saving Ordinance = legal requirement, 100 stands for 100% level of legally required energy efficiency)**

4.4 EU Funding for Sustainable Energy in Buildings[6]

The EuroPHit pilot projects shall create a demand for further step-by-step retrofits of buildings with advanced technologies. Promotional funding by the European Union or by national or regional schemes and by the Development Financial Institutions (like CEB, EIB, EBRD and KfW) can support this development by the provision of grants, guarantees and preferential credit-lines via local commercial financial institution (CFI) which act as the on-lending banks. The following section shall give an overview of the available financial instruments which can be used by the CFI to support the energy efficiency in buildings and the EuroPHit project. The following summaries of the promotional funding programs are based on the statements of the respective institutions.

The EU Commission makes direct financial contributions to support projects or organisations which help implement an EU programs or policies. Grants and funding are awarded by:

- The **Commission Directorate-General** (DG) directly responsible for the policy in question
- Commission **offices and agencies** around Europe
- National or regional authorities.

Most relevant for the EuroPHit Project are the promotional programs offered by the:

- DG ENERGY http://ec.europa.eu/energy/index_en.htm,
- DG REGIO http://ec.europa.eu/regional_policy/index_en.cfm
- DG ENVIRONMENT http://ec.europa.eu/environment/index_en.htm

[6] This section is based on the respective web pages of the EU internet presentations. Partly the text is copied from those web-pages.

Mostly grants are awarded by tenders, or by special programs and projects. Several funds cover aspects of energy efficiency and buildings and renewable energies. The definitions of the programs targets and topics are sometimes overlapping, so that a regional program provided by the DG REGIO may contain a topic which could also be used to finance building retrofits as well as a program which contain energy efficiency provided by the DG Energy. Therefore it is important to discuss possible financing with the EU, the local administration and the Development Financial Institutions, like the EIB who is implementing most of the promotional programs of the EU. The EU Budget periods cover 7 years. The new period has started for 2014 to 2020. The programs (HORIZON) which include energy efficiency of buildings are designed to achieve the 2020 targets of the EU.

The detailed management of programs which receive support from the Structural Funds is the responsibility of the Member States. For every program, they designate a local managing authority which will inform potential beneficiaries, select the projects and generally monitor implementation. An overview of the administration (national and regional authorities) in charge provides the following web page: Managing authorities http://ec.europa.eu/regional_policy/index_en.cfm. Here a country can be selected and the contact information for the managing authorities of the various programs will appear below on this page http://ec.europa.eu/regional_policy/manage/authority/authority_en.cfm?pay=120&list=no

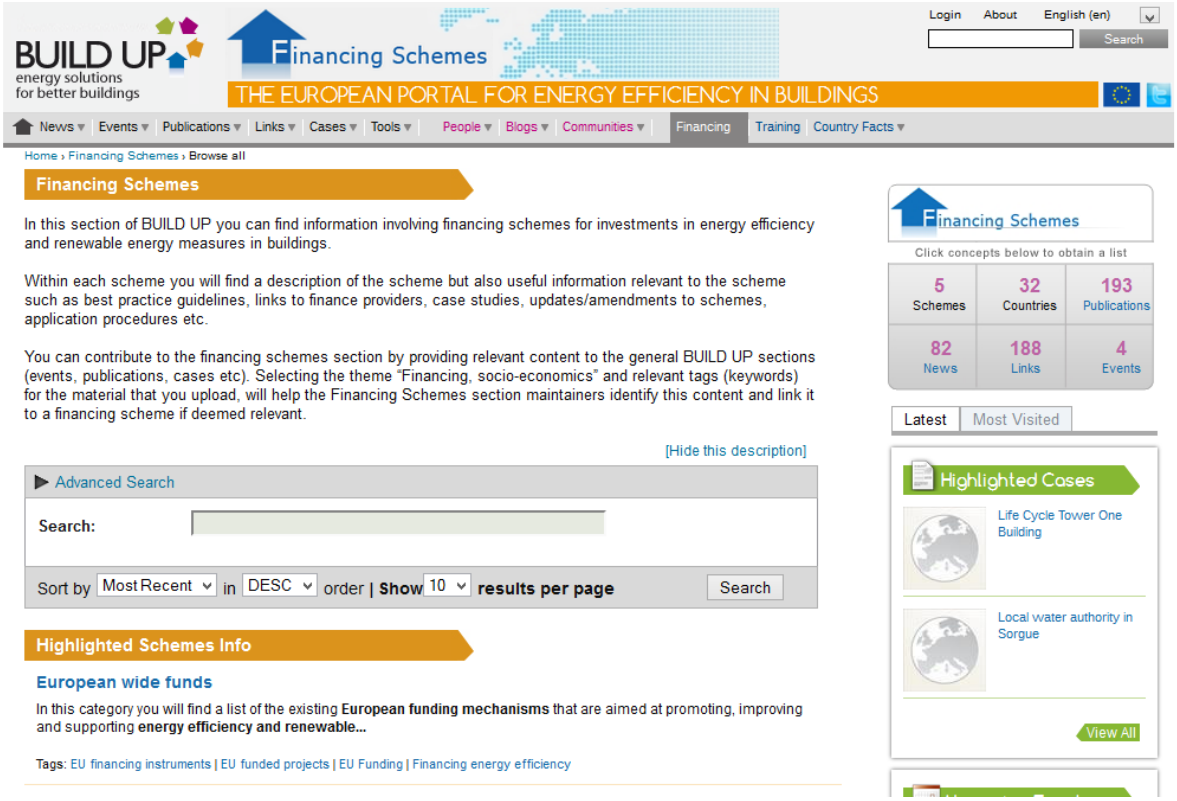
For the EuroPhit Project grants are needed to finance technical assistance and energy consulting for the implementing CFIs and the end-users of promotional programs. Energy advice is needed to design the step by step retrofit concepts, to supervise the retrofit process and finally to issue the energy performance certificate, according to the requirement of the EU building directive or the EnerPhit standard (see below).

4.5 Europe-wide funds

http://www.buildup.eu/financing-schemes/35692

In this category you will find a list of the existing **European funding mechanisms** that are aimed at promoting, improving and supporting energy efficiency and renewable energy in the residential, commercial and industrial sectors. The European Commission has set up the **Executive Agency for Small and Medium-sized Enterprises (EASME) to manage on its behalf most of the schemes, see** http://ec.europa.eu/easme/ **.** Some of them are exclusively linked to energy efficiency and renewable energy, while others have more general goals that tackle infrastructure and regional development, but can also be applied to energy related projects.

Figure 7: Funding sources and promotional programs offered in Europe, see *http://www.buildup.eu/financing-schemes*



These funding mechanisms can be directly involved in financing a project or indirectly through the allocation of funds to national governments for the facilitation of a wide range of projects.

For the EuroPHit project the following financing schemes may be used (*the suitable financing schemes are discussed in more detail below):*

- Intelligent Energy – Europe programme (IEE) including ELENA
- LIFE (2014-2020) and PF4EE, the financial instrument for energy efficiency
- COSME – the Programme for the Competitiveness of Enterprises and Small and Medium Enterprises (SMEs)
- Horizon 2020 Framework Programme
- European Structural and Investment Funds (ESI) 2014-2020
- Financial incentives supporting EPBD recast objectives (Article 10, Directive 2010/31/EU)

The **main EU funding source for energy efficiency in buildings** are the European Structural and Investment Funds (ESI), as the sector is an important component of the Thematic Objective 4 - Low Carbon Economy, see http://ec.europa.eu/regional_policy/sources/docgener/informat/2014/guidance_fiche_energy_efficiency.pdf

The specific contribution of ESI in terms of percentage of the total project cost depends on the co-funding rates defined in the different Operational Programs by the Member States.

In addition to this, EU funds can provide grant support to the preparation of projects through ELENA, see http://ec.europa.eu/energy/intelligent/getting-funds/project-development-assistance/index_en.htm. For the rest, JESSICA basically facilitates the use of ESI in the context of

urban development funds and instruments like PF4EE (supported by LIFE) and European Energy Efficiency Fund (EEE-F) aim at attracting private funding to the projects.

The Europe-wide financing schemes are described **in Annex 6.2**

4.6 National and Regional schemes

4.6.1 National/Regional schemes for Individuals

http://www.buildup.eu/financing-schemes/35693

In this category you will find a list of the existing national and regional funding mechanisms that are aimed at **natural persons**, usually an owner or tenant of a residential building or apartment.

These schemes are aimed at small scale projects, either through non-repayable grants or through preferential soft loans. Their goal is to promote energy efficiency and renewable energy among a wide range of people that lack the incentive or the financial means to invest in expensive renovations and installations.

4.6.2 National/Regional schemes for Individuals for Municipalities/Social Housing

http://www.buildup.eu/financing-schemes/35694

In this category you will find a list of the existing national and regional funding mechanisms that are aimed at **legal persons**, e.g. companies, SMEs, municipalities, homeowners associations etc.

These schemes have greater diversity than those aimed at natural persons, because they range from relatively small, single-building interventions to large neighbourhood-scale projects. The funds can be available in the form of non-repayable investments and/or favourable loans (often a combination of the two).

4.6.3 National/Regional schemes for Residential Buildings

http://www.buildup.eu/financing-schemes/35695

In this category you will find a list of the existing national and regional funding mechanisms that promote energy efficiency and renewable energy in new and existing **residential buildings**, irrespective of the identity of the owner, developer or tenant. The energy-related funding mechanisms that exist for residential buildings range from relatively small grants for single-family apartments to sizeable investments in large scale housing projects.

The funding of residential building renovations may also have a social scope, since it enables current and future tenants to enjoy a more comfortable life and pay less in energy bills, without incurring a significant capital cost for the actual renovation.

4.6.4 National/Regional schemes for Non-Residential Buildings

http://www.buildup.eu/financing-schemes/35696

In this category you will find a list of the existing national and regional funding mechanisms that promote energy efficiency and renewable energy in **non-residential buildings and facilities**, such as commercial and office buildings, public buildings, industrial facilities etc. These funds are available in the form of non-repayable investments and/or preferential soft loans (often a combination of both).

Non-residential buildings are usually very energy intensive. Large scale heating and air-conditioning is almost constant, electrical equipment is plentiful and in frequent use. With proper planning and high quality work, there is much room for improvement in the overall energy efficiency of such buildings.

4.7 European Development Financial Institutions

Besides their role in implementing EU funding programs (see above), the European Development Financial Institutions (DFI) - CEB, EIB, EBRD and KfW- operate their own investment instruments for energy efficiency in buildings resulting in higher funding volumes in the building sector.

4.7.1 CEB

The **Council of Europe Development Bank (CEB)** is a multilateral development bank with a social vocation. CEB contributes to the implementation of socially oriented investment projects through four sectoral lines of action, namely:

- strengthening social integration
- managing the environment
- supporting public infrastructure with a social vocation
- supporting micro-, small and medium-sized enterprises (MSMEs)

The main purpose of CEB loans is to finance projects for the construction of housing, renovation or refurbishing of the existing housing stock and for the conversion of buildings into housing so as to provide decent and affordable housing for low-income population groups.

http://www.coebank.org/index.asp?ChangeLangue=EN

CEB contact: http://www.coebank.org/contact.asp?arbo=136&theme=7&lang=EN

4.7.2 EIB

The **European Investment Bank (EIB)** is the implementing bank for most of the financial programs of the EU. EIB Contacts: http://www.eib.org/infocentre/contact/index.htm.

The EIB in cooperation with the EBRD and other FIs has introduced several additional financial support mechanisms for the Structural and Cohesion Fund (SCF) in developing and co-ordinating financial instruments in the framework of Cohesion Policy with activities focused on the programs JESSICA, JEREMIE, JASPERS and JASMINE. In line with this pledge and the possibilities provided in the framework of the Structural Funds, there has been experience in connecting financial means from the Structural Funds with EIB funds to create revolving financial instruments for EE. One example is the JESSICA model that involves dedicating part of the Structural Funds to create revolving fund to support integrated urban development, including EE investments. **JESSICA** offers a scalable model to channel ERDF funds into EE and to leverage further public and private funds**.**

EIB makes loans to local banks and other intermediaries which subsequently "on-lend" to the final beneficiaries, such as national administrations and public sector bodies, see http://www.eib.org/products/intermediated/index.htm?lang=en

Loan conditions can be flexible in terms of the size, duration, structure etc. Lending decisions remain with the intermediary institutions, which also retain the financial risk of the on-lending. EIB has no contractual relationship with final beneficiaries. The intermediary FI must transfer a financial advantage reflecting the impact of EIB funding.

EIB Guarantees & Securitisation

http://www.eib.org/products/guarantees/index.htm

EIB guarantee large and small projects to make them more attractive to other investors. EIB provides guarantees for senior and subordinated debt, either in a standard form or as a debt service guarantee. Beneficiaries can be large private and public projects.

Depending on the underlying funding structure of the operation, a guarantee may be more attractive than one of EIB loans. It may either provide greater value-added or require lower capital charges. Under capital adequacy rules EIB guarantees provide a zero risk weighting to the guaranteed obligation.

4.7.3 EBRD

The European Bank for Reconstruction and Development (EBRD) addresses energy efficiency and climate change through its Sustainable Energy Initiative, including the bank's Residential Energy Efficiency Credit Line (REECL) Framework. For example EBRD has launched special programs to improve energy efficiency of public buildings, i.e. Sofia Municipality.. http://www.ebrd.com/pages/homepage.shtml#&panel1-3

EBRD Contact: http://www.ebrd.com/pages/about/contacts.shtml

4.7.4 KfW

As a promotional bank, KfW Bankengruppe supports sustainable use of energies in Germany, Europe and throughout the world, see www.kfw.de . The potential which residential buildings offer in respect of energy efficiency and savings of green house gases has been demonstrated in Germany by the KfW programs "Energy-efficient Construction and Refurbishment". In the EU banks receive global loans from KfW under the ELENA facility to fund the financing of investment projects of final beneficiaries and investors, including retrofit of buildings (see ELENA facility in Annex 6.2).

5 Design of an EuroPHit Financing Program

5.1 Basic approach

Financing has to take into account that the initial investment cost as well as current cost can be recovered and repaid to the projects sponsors (equity), the bank or a public lending institution. Therefore, after checking whether the future income stream is sufficient to cover such cost the characteristics of this stream has to be analysed. Such analysis has to be done individually, but there are also common characteristics of building refurbishment projects, such as:

- High initial investment cost (upfront cost)
- Long gestation periods (8-30 years), which are unusual for financing in many countries
- Apart from energy related cost and benefits there are also renovation cost/benefits ("incidental cost" and "anyhow cost") which normally will not generate any future savings or income
- Because of long repayment periods and price fluctuations insecurity about the future development
- External effects which do not appear as "real" benefits available for loan repayment
- Behavioural resistance of house owners, to bear high upfront cost for savings which will stretch over 8-30 years

To overcome such difficulties and to compensate for the invisible external benefits, public institutions provide a wide variety of supports which have been described in chapter 4.

Public supports can help:

- To shorten the long repayment periods and to make a project financeable by market based instruments
- To lower the financial burden in the initial phase
- To create trust for a refurbishment project in order to find financing sources, especially in countries where the type of project is still unknown
- To provide at least partial guarantees as replacement for collaterals
- To improve the cash flow and the net-present value of a project in order to find project sponsors (equity as well as loan financing)
- To compensate for external, but intangible benefits (like CO_2 reduction)
- To improve the financing structure in particular for communities and public institutions lacking financial sources under strict saving requirements
- To reach ambitious targets
- To provide good quality and guarantee performance
- To provide and implement refurbishment plans.

Therefore such supports and their frequently rather complicated requirements should be taken into account when planning a project. Since, however, no project will be fully supported by such public funds, a combination of both market-based instruments (e.g. loans, forfaiting, energy performance contracting schemes), and public funding programs and grants must usually be applied. Public funds can also help to aim at “deep renovation” going beyond minimum energy performance requirements to capture all possible energy savings, since most buildings undergo major renovation only every 20 or 30 years.

5.2 Finance options

Public finance options, even if they are EU-funded, will usually be provided in the framework of a national programme (see chapter 4). There are numerous national schemes, like the “fonds chaleur” and the “0 per cent interest eco-loan” in France, the “schools energy efficiency loan scheme” or the “energy efficiency loan scheme for SME” in UK, the “warm homes scheme” in Ireland, the “crap your oil fired boiler”- scheme in Denmark, KfW “energetische Stadtsanierung” and “KfW Effizienzhaus “in Germany, “grants for housing rehabilitation” in Spain or “Tax deduction for building rehabilitation” in Italy, just to name a few examples. (http://www.buildup.eu/financing-schemes/35695).

They must usually be combined with credit-lines by local CFIs which include grant funds provided by grants of the EU or the local government budgets. If grants are available to support the implementation of financing programs, such grants can be used:

- for technical assistance to the borrowers (to pay for energy advisors)
- to pay for technical advice on financing of retrofit concepts

- to finance a repayment bonus (redemption grant) to reward the achievement of certain energy efficiency targets (calculated total primary energy demand of the whole building) which should be confirmed by qualified energy advisors
- To reduce the interest rate and soften the loan conditions.

The applicants for public support must be prepared to face quite some “red tape” setting preconditions for support, some are just supporting consulting services and there is always an upper limit in subsidies, which seldom exceeds 10-20% of the investment cost. Disbursement of grants or loan parts are usually tied to the achievement of certain efficiency steps and have to be certified by an independent consultant. Nevertheless, since applications are often made via the applicant’s bank, they can often serve as a kind of “entrance ticket” for market based financing. In many cases public support can make the difference between a project with negative and positive net present value.

Public support should also enable the investor to go for a more ambitious, more efficient long term solution (”deep renovation”) with eventually higher investment in the beginning (although the life cycle costs might even be lower). They force the applicant to consider the ultimate goal of a refurbishment, even if it is done in steps.

Refurbishment buildings will usually also include the so called “Anyhow investments”, which are not necessarily income generating since neither the refurbishment of a cracked wall or a replacement of a roof after end of its physical life will justify any rent increases. Such investments have to be financed either from equity or from separate bank loans, based either on collateral or on the proprietor’s income. The same is true for municipalities, who will have to finance such investments either from budget funds or from separate loans being repaid from the ordinary budget.

Figure 8: Refurbishment investment and financing

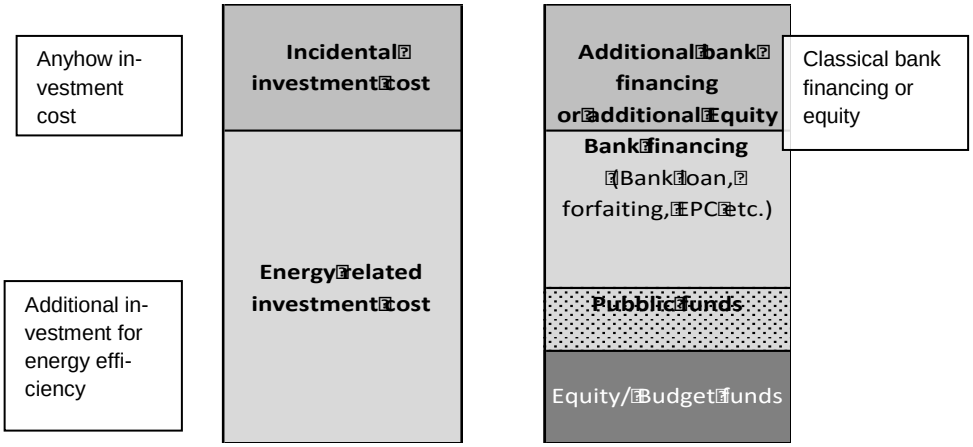


Figure 8 gives an overview of a combination financing scheme for a building refurbishment investment. The left column shows the two types of investment: the energy related and the incidental investment cost. The latter will be financed (right column) from an additional bank loan or equity (for public institutions: budget funds), the energy related part can be financed by a combination of equity/budget funds, public funds or public support schemes and bank financing. Financing can take on a variety of combinations like just normal bank loans, energy performance contracting or forfaiting. Public supports can be grants, subsidised loans, repayment subsidies or just guarantees enabling the investor to take a larger commercial loan. There is no “golden” way to financing: every alternative has its pros and cons as described in chapter 3 and the same applies to public supports

(chapter 4). The necessary support instruments will vary from case to case, depending on the national or regional circumstances, e.g. ownership structures and social situation, and the design of the schemes will have to be tailor-made on this basis.

A financing program for EuroPHit projects needs to care about the special features of such projects, such as the step-by-step approach to refurbishment of a building to reach the EnerPHit standard. Mostly there are only small investment volumes of single projects. The returns in form of savings on energy-bills are spread over the life cycle of the projects and depend on the energy efficiency level achieved with each single step. Regarding the investment measures the EnerPHit standard stresses the advanced state of the art and the “life cycle costs”.

Public supports and the ability for long term financing will also enable the investor to have a look at the life-time situation of the investment, in particular whether under consideration of the life cycle cost it is a more economically viable solution to go for higher standards, like for example triple glazed instead of double glazed windows, which will yield energy savings of 90% instead of 50% although it probably means 30% higher investment cost.

To support a step by step retrofit the achievement of certain energy efficiency targets can be combined with the provision of a bonus system. A repayment bonus financed from a grant (redemption grant) can be used in connection with loans to reward the borrower when certain energy efficiency targets have been achieved by single steps or by the completed retrofit project. As soon as a certain level of energy efficiency is achieved by the retrofit of the building a repayment bonus can be rewarded (see above section 4, in particular).

5.3 Special Issue of joint home ownership of residential buildings

Specific issues arise with blocks of flats with individual owners, whereby owners' associations need to be involved in line with the specific legislation and practices. Such renovations should pay due attention to the ventilation systems, maintaining a healthy indoor environment. Investments in multi-apartment housing should always consider the installation of individual heating/cooling/hot water metering with related investments.

The Energy Efficiency Directive requires introduction of individual metering and billing information based on actual consumption of heat/cooling/hot water consumption where technically possible and cost-effective in all multi-apartment buildings with a common heating/cooling/hot water source, see http://ec.europa.eu/energy/efficiency/eed/eed_en.htm

For the social aspects of retrofit projects especially in case of retrofit of social housing projects and recommendations to overcome the owner-tenant dilemma see **Annex 6.3**

6 ANNEX

6.1 Public financing mechanisms

The text is partly copied from the following EU documents:

Technical Guidance, Financing the energy renovation of buildings with cohesion Policy funding, final Report, A study prepared for the EC DG Energy, EU 2014
ISBN 978-92-79-35999-6 (See Table 6, page 63ff and APPENDICES)
http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/financing_energy_renovation.pdf

Financing energy efficiency: Forging the link between financing and project implementation, report prepared by the Joint Research Centre of the European Commission, Authors: Silvia Rezessy and Paolo Bertoldi, May 2010, see http://ec.europa.eu/energy/efficiency/doc/financing_energy_efficiency.pdf

6.1.1 Grants

Short description

Grants are non-reimbursable financial contributions for the implementation of specific energy efficiency and renewable energy measures (Sustainable Energy SE) selected by the final recipient from a pre-defined list. Grants are one of the most common forms of financing for SE projects, particularly where technologies are pre-commercial or in the early stages of commercial deployment or are otherwise prohibitively expensive.

Main characteristics

- A grant will often cover only part of the total cost and usual requires some form of co-financing.
- Rates may vary from 20% up to a maximum of around 75%.
- Target recipients and measures can be defined through the use of eligibility criteria.
- Grants can be combined with other financing mechanisms, such as preferential loan schemes, to incentivise the uptake of measures that are less likely to be selected because they have longer pay-back times.

Implementation

Grants and subsidies may be managed directly through a national administration or, if combined with preferential loans, through a dedicated fund.

Advantages of Grants

- Versatile and can be used to achieve a variety of policy objectives. In the context of SE, grants can be deployed to support innovation and technology development and can also be used to target support at specific end-users to meet social policy objectives such as fuel poverty.
- Can be used for proof of concept and demonstration activities and to encourage uptake of innovative / below cost-optimal measures.
- Enable SE measures identified as priorities by policy makers to be implemented.
- Conditions can be attached to grants to stimulate further private investment (e.g. require the simultaneous installation of other EE measures).
- Represent a flexible mechanism that can be used in combination with other financial mechanisms or technical assistance packages.
- Particularly suitable for economically depressed areas, immature / financially constrained markets.

Disadvantages of Grants

- Risk that desired outcomes are not achieved (e.g. investment in a specific type of measure).
- Risk of overspend if grant distribution process is not carefully communicated and managed.

- Can only be used once (compared with revolving funds for example), therefore limiting the utility and sustainability of public funding.
- Limited leverage and impact, tendency towards overpriced solutions.
- Little transparency and performance control.

Project types

- Grants are usually conceived to promote new technologies and are more suitable for early stage development including projects below cost-optimal levels.
- A grant may cover the cost of technical assistance to private and public beneficiaries/recipients to support them in the best choice of SE measures.

Project examples

- The Initiative for Energy Conservation in Houses “EXOIKONOMISI KAT’ OIKON” in Greece provides a good example of a scheme using grants in combination with loans. The program finances energy saving measures (e.g. thermal insulation, boiler replacement) for home owners. €396million (from ERDF) is divided between a revolving fund (€241 million) and a grant fund (€155 million). The loans paid out of the revolving fund have to be matched by commercial loans of equivalent value. The interest rate of the ERDF loan and the value of the grant depend on the income of the applicant (zero interest loans and 30% grant for low income households, low interest loans and 15% grant for medium income households, low interest loans only for households with a high income).
- The Renewable Heat Premium Payment (RHPP) in the UK is a grant scheme designed to increase the use of renewable heat technology (biomass boilers, solar thermal, and ground and air source heat pumps) in the domestic sector (including social landlords). Installations of certified technologies by certified installers are eligible for a grant that represents approximately 10% of the installed cost. Eligibility for most technologies is restricted to rural households that are not connected to the gas grid, thereby maximising the carbon savings associated with the scheme. This short-term, two year, scheme aims to maintain and build the renewable heat industry ahead of the introduction of a longer-term support program.

6.1.2 Soft loans

Preferential loans or soft loans refer to the acquisition of funds through borrowing: a lender provides a loan to a borrower for a defined purpose over a fixed period of time. The loan is provided at lower interest rates. Typically the interest rates are fixed over a certain period of time, usually 10-20 years and allow for long-term maturity.

Advantage of preferential loans

- Final recipients are incentivised to select the most appropriate and cost effective measures.
- Well understood mechanism among all parties
- Since loans are repaid, the money can be reinvested into more projects.
- Provided that the right conditions are present, preferential loan mechanisms are not particularly difficult to administer.

Disadvantage of preferential loans

- EE savings may not always be considered as a cash flow by some financial intermediaries, often extending the payback period for the measure.
- Not very suitable for poorer households who have no income to repay the loan.

6.1.3 Revolving funds

Revolving funds offer loans that can be repaid with the extra cash available due to savings of energy. The repaid loans are used to finance new EE projects. The funds are reimbursed by projects out of savings accumulated through energy efficiency and capacity gains. They are intended to channel liquidity into markets where there is a constraint both in terms of access to financing and in terms of the amount of financing available, that is, where liquidity is constrained. Revolving funds inject special purpose public finance into the commercial finance system and are an appropriate tool when **lack of liquidity** in the finance sector is a major constraint for private finance to EE or when financial institutions need **long-term credits to provide loans with longer tenor**.

Revolving funds are self-sustaining financial schemes, which usually require one-time initial investment. In the area of energy efficiency, a revolving fund could combine public-sector grants and adequate financing structure for energy efficiency funding, provide loan guarantees to cover the default risks related to energy efficiency investments, and provide private sector loans in an adequate size. In order to have the maximum benefits from the savings obtained through investments of the revolving fund, **an adequate and systematic monitoring of energy savings is required**. The advantage of revolving funds is that they are less dependent on external investors. If they are operated effectively, revolving fund can contribute to a permanent financing structure for energy efficiency investments, which is separate from political influence.

Typical disadvantages for using revolving funds in energy efficiency are that they require substantial upfront investment and also might be cumbersome and expensive to administer.

6.1.4 Guarantees

Short description

Guarantees are a type of risk sharing mechanism where the guarantor (e.g. a public body) assumes a debt obligation should a borrower default. For limited or partial guarantees the guarantor is only liable for part of the outstanding balance at the time of default, usually defined as a fixed percentage.

Main characteristics

While a number of guarantee structures exist, the main features that must be set out include:

Clear definition of the circumstances which would trigger the guarantee payment; the risk sharing formula; timing and calculation of guarantee claim payment; Responsibilities for collections against defaulting borrowers; disposition of recovered monies; maximum single loan guarantee exposures; guarantee approval and issuance procedures; and, guarantee fees.

Implementation

With partial credit guarantees the contracts are between lender and borrower (loan agreement) and between guarantor and lender (guarantee agreement). In partial risk guarantees the contracts are between guarantor and investor/lender and between guarantor and host country government.

Advantages

Guarantees help bridge the gap between the credit risk perceived by the lender and the actual credit risk. They can provide additional comfort to financial institutions, particularly local institutions, in relation to technologies or project approaches where they have less experience. The guarantee can therefore help project developers (or loan applicants) to access finance and reduce the cost of capital. Partial-risk guarantees enable the loan repayment period to be extended and the interest level to be reduced, thus improving project

cash flow and viability. They can also increase debt-to-equity ratios, enhancing returns to project developers. Guarantees backed by public bodies help to direct the flow of private funds towards EE projects through risk mitigation, and therefore lever higher levels of private financing.

Disadvantages

Guarantees are not appropriate for all market situations and are not necessarily suitable for use in isolation. Where liquidity in financial institutions is considered the main barrier to financing, guarantees are of limited use. However, guarantees can form part of a broader strategy to increase lending among banks with good liquidity but a low risk appetite.Partial credit guarantee schemes do not provide an adequate solution to situations where a project investor has insufficient equity.

Project types

Guarantees can be used to help smaller financial institutions and ESCOs access capital at an acceptable cost.

Project examples

The Bulgarian Energy Efficiency Fund (BgEEF) offers partial credit guarantees as well as portfolio guarantees for ESCOs and for the residential sector. The ESCO portfolio guarantee covers up to 5% of defaults from the delayed payments of an ESCO portfolio; with this guarantee an ESCO can get better interest rates on its debt with commercial banks. The BgEEF acts as a financial buffer to take the shocks since delays in payments are more probable than clients defaulting.

Other examples include guarantee programmes provided by development and public banks – for instance KfW in Germany (described above), the Czech Guarantee and Development Bank in Czech Republic, KredEx in Estonia, BPME and Ademe

6.1.5 Energy Efficient Mortgage

An energy mortgage is a mortgage that credits a home's energy efficiency in the home loan. For an energy efficient home, for example, it could mean giving the home buyer the ability to buy a higher quality home because of the lower monthly costs of heating and cooling the home. For homes in which the energy efficiency can be improved, this concept allows the money saved in monthly utility bills to finance energy improvements. There are two types of energy mortgages:

- *Energy Improvement Mortgage (EIM)* - finances the energy *upgrades* of an existing home in the mortgage loan using monthly energy savings
- *Energy Efficient Mortgage* (EEM) - uses the energy savings from a *new* energy efficient home to increase the home buying power of consumers and capitalizes the energy savings in the appraisal

Essentially, an EEM is a reduced rate mortgage that credits the energy efficiency of the building in the mortgage itself. To get an EEM a borrower typically has to have energy rating conducted before financing is approved. This verifies to the lender that the building is energy efficient. In the United States EEMs are typically used to purchase a new home that is already energy efficient such as an Energy Star qualified one. Such a system could also be applied to a certified Passivhaus.

An EIM is used to purchase existing homes that will have an energy efficiency improvement made. EIMs allow borrowers to include the cost of energy efficiency improvement in the mortgage without increasing the down payment. EIMs allow borrowers to use the money saved in utility bills to finance energy improvements. In the US both EEMs and EIMs require a home energy rating (building certification) to provide the lender with the estimated monthly energy savings and the value of the energy efficiency measures.

As an example of EIM in the EU, in 2009 France introduced eco-mortgage to undertake energy conservation works, which can be used in tandem with tax credits that are also available for home energy conservation. The mortgages *l'éco prêt à taux zéro (éco PTZ)* are available for a sum of up to 30,000 euro, subject

to a limit of 300 euro/m² of the property. They are only available on a property constructed between 1948 and 1990. Repayment of the mortgage is over a period of 10 years, although in some cases the repayment period can be extended to 15 years. The mortgages are offered without a test of resources and are not subject to maximum income limits. The type of works envisaged by the regulations includes wall insulation, double and secondary glazing, new entrance doors, and replacement energy efficient space and water heating systems. The works will need to meet a minimum level of performance as set out in the regulations. The loans are available through the major French banks[7].

Vermont and several other US states, where a uniform national Energy Star rating system has been adopted, provide successful examples of EIM and EEM. The Energy-Rated Homes of Vermont (ERH-VT) program provides a one-stop service to obtain EIM. In order to qualify for an EIM, an energy rating must be performed. ERH-VT provides the energy assessment, obtains contractor bids for the planned measures, oversees the contractor's work, conducts a post-construction energy rating and prepares documents to secure the energy efficiency mortgage.

6.1.6 On-bill financing

Integrating loan payments with energy bills and allowing utilities to cut off energy supply to defaulting customers has the potential to both lower collection costs and enhance credit quality of the financing scheme, thereby lowering financing costs. Payment via utility bill reduces risk of credit default and lowers collection risk.

Energy regulators may disapprove and distrust the addition of loan repayments into utility bills, preferring to keep the utility/customer contractual relationship implicit in utility billing simple and straightforward, and resisting, in particular, provisions allowing customer disconnection due to loan repayment default[8].

6.2 Europe wide funds

6.2.1 ELENA

ELENA (European Local ENergy Assistance) financing facility for cities and regions is a technical assistance facility that mobilises funds for investments in sustainable energy at local level across the EU. The ELENA facility is provided within the framework of the IEE II program (Intelligent Energy Europe) and supports local and regional authorities in contributing to the "20-20-20" initiative of the EU.

[7] In social housing the loan is available in all French banks for large refurbishment projects (at least 2 different kind of tasks). Preferential loans for retrofitting social housing Eco Pret Logement Social apply for 2009 and 2010 with a 1.9% interest rate. The loan is up to 16 000 € for 15 years, available at the Caisse des Dépôts for refurbishment of social housing.

[8] In 2009 this model was introduced via the Clean Energy Works Program (CWEP) in Portland (Oregon). Under CWEP single-family residential homeowners can receive 100% financing to implement a wide range of EE measures. Loans are provided at attractive levels of fixed interest rates and are amortized over a 20-year period. Customers repay loans through their regular utility bill.

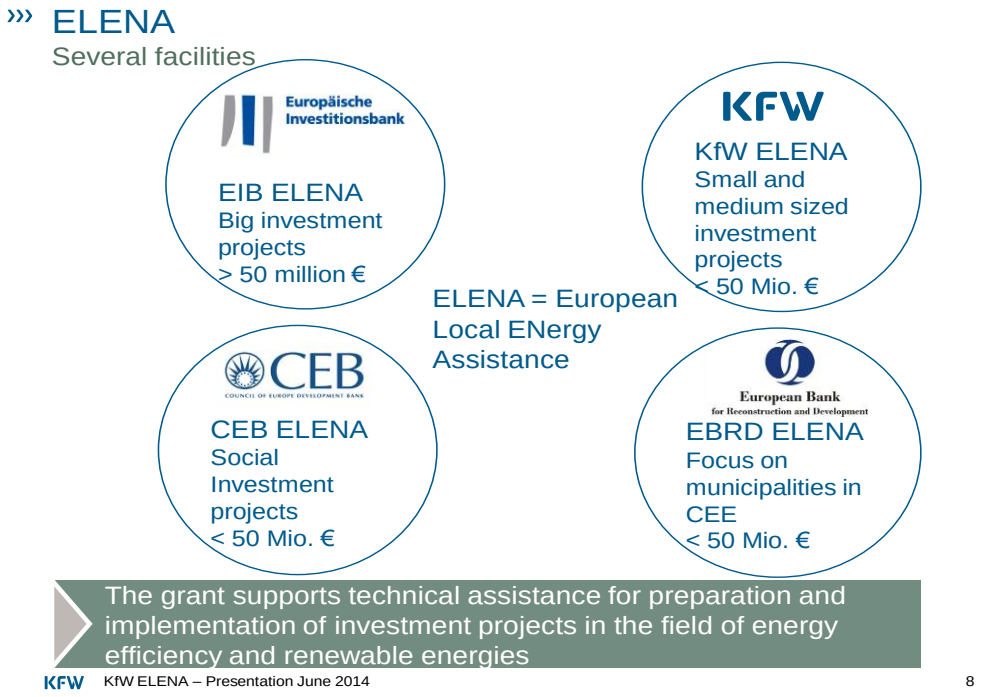


Figure 9– ELENA facilities at the DFI

ELENA covers a share of the cost for technical support that is necessary to prepare, implement and finance the investment program, such as feasibility and market studies, structuring of programs, business plans, energy audits, preparation for tendering procedures. ELENA covers up to 90% of the technical support cost needed. There are four ELENA facilities, all managed by the Development Financial Institutions: CEB ELENA, EBRD ELENA and KfW ELENA (project size between EUR 6 and 50 m) and EIB ELENA (project size > EUR 50 m). Country restrictions apply to CEB ELENA and EBRD ELENA. It is funded through the European Commission's Intelligent Energy-Europe program.

See http://ec.europa.eu/energy/intelligent/getting-funds/project-development-assistance/index_en.htm.

The KfW-ELENA facility offers a approach in order to mobilize sustainable investments of small and medium sized municipalities and, where appropriate, Energy Service Companies (ESCOs).

KfW-ELENA consists of two elements:

- ELENA grant from the European Commission for Project Development Services
- global loans to local participating financial intermediaries (PFIs) in order to target smaller investments (volume up to EUR 50 million).

Eligible Participating Financial Intermediaries are banks motivated to expand their lending to municipalities for the financing of sustainable energy projects. **Eligible Participating Coordinating Entities** must have the required institutional capacity and experience to coordinate a carbon credit program. **Eligible Final Beneficiaries** of Technical Assistance are local or regional authorities and other public bodies within IEE participating countries

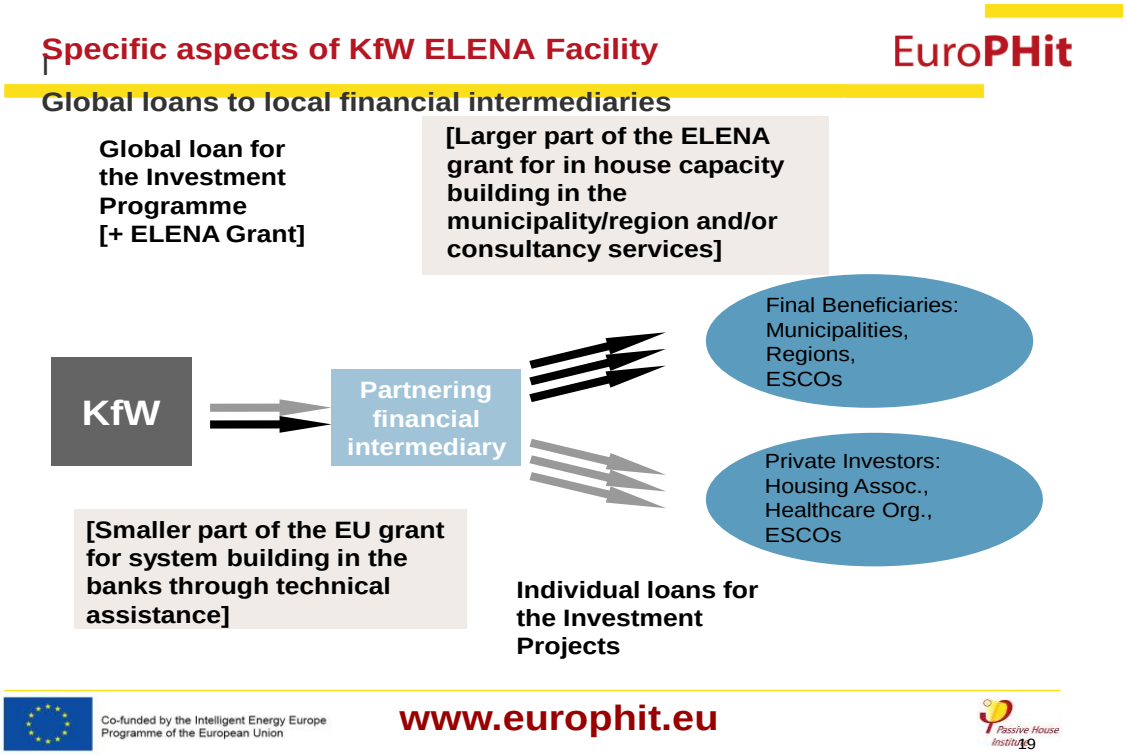


Figure 10: KfW ELENA facility

Financial institutions may contact the EIB or KfW to receive grant funds and long term loans for the financing of retrofit projects according to the EnerPHit standard. At KfW-ELENA the interest rate for the global loan depends on the financial standing (creditworthiness) of the participating financial intermediary.

6.2.2 LIFE and PF4EE

http://ec.europa.eu/environment/life/funding/life2014/index.htm

LIFE is the EU's financial instrument supporting environmental and nature conservation projects. The general objective of LIFE is to contribute to the implementation, updating and development of EU environmental policy and legislation by co-financing pilot or demonstration projects with European added value.

The new LIFE (the Financial Instrument for the Environment) Regulation establishes the Environment and Climate Action sub-programs of the LIFE Program for the 2014–2020 funding period, with a budget set at €3.4 billion in current prices. Funding will be given to the following two pilot financial instruments for the purpose of achieving the general objectives of the LIFE Regulation:

- Natural Capital Financing Facility (NCFF)
- Private Financing for Energy Efficiency instrument (PF4EE)

PF4EE contributes to meeting the general objectives of the LIFE Regulation further specified in the priority area "climate change mitigation". The implementation of the PF4EE instrument will be entrusted to the European Investment Bank (EIB) through indirect management.

6.2.3 LIFE Action Grants

http://ec.europa.eu/clima/policies/budget/life/grants/index_en.htmPolicy

Grants are available for a variety of different climate action projects including pilot, demonstration, best practice and capacity building projects. Grants are also available for non-profit organisations, including NGOs, working towards climate goals at European level.

Action grants are aimed at projects that pursue general and specific objectives of the priority areas. There are several different types of projects:

- **Practice projects:** These projects apply appropriate, cost-effective, state-of-the-art techniques, methods.
- **Pilot projects:** These projects apply a technique or method that has not been applied or tested before or tested only outside the EU and that offer potential climate advantages compared to current best practice.
- **Demonstration projects:** These projects put into practice, test, evaluate and disseminate actions, methodologies or approaches that are new or unknown in the project's specific context, such as geographical, ecological, socio-economic, and that could be applied elsewhere in similar circumstances.
- **Best practice projects** and approaches taking into account the specific context of the project;
- **Information, awareness and dissemination projects:** These projects aim to support communication, dissemination of information and awareness-raising in the field of climate action.

"Traditional" projects cover i.a. the priority areas:

- LIFE Climate Change Mitigation
- LIFE Climate Change Adaptation

"Traditional" projects may be **best-practice**, **demonstration, pilot** or **information, awareness and dissemination** projects. **Best practice projects** apply appropriate, cost-effective and state-of-the-art techniques, methods and approaches taking into account the specific context of the project; **demonstration projects** put into practice, test, evaluate actions, disseminate methodologies or approaches that are new or unknown in the specific context of the project, such as the geographical, ecological, socio-economic context, and that could be applied elsewhere in similar circumstances; **pilot projects** apply a technique or method that has not been applied or tested before, or only elsewhere, that offer potential environmental or climate advantages compared to current best practice and that can subsequently be applied on a larger scale to similar situations; **information, awareness and dissemination projects** aim at supporting communication, dissemination of information and awareness raising in the fields of the sub-programs for Environment and Climate Action.

The EuroPHit project meets the criteria of LIFE Climate Change Mitigation (sub-program for Climate Action) and partly also LIFE Climate Change Adaptation (sub-program for Climate Action), see: ***http://ec.europa.eu/environment/life/funding/life2014/index.htm***

LIFE Climate Change Mitigation (sub-program for Climate Action) will co-finance action grants for **best practice**, **pilot** and **demonstration** projects that contribute to the reduction of greenhouse gas emissions; that contribute to the implementation and development of Union policy and legislation on climate change mitigation, including mainstreaming across policy areas, in particular by developing, testing and demonstrating policy or management approaches, best practices and solutions for climate change mitigation; that improve the knowledge base for the development, assessment, monitoring, evaluation and implementation of effective climate change mitigation actions and measures and that enhance the capacity to apply that

knowledge in practice; that facilitate the development and implementation of integrated approaches, such as for climate change mitigation strategies and action plans, at local, regional or national level; and that contribute to the development and demonstration of innovative climate change mitigation technologies, systems, methods and instruments that are suitable for being replicated, transferred or mainstreamed. See also the LIFE section of the DG Climate Action web-site.

LIFE Climate Change Adaptation (sub-program for Climate Action) will co-finance action grants for **best practice**, **pilot** and **demonstration** projects that contribute to supporting efforts leading to increased resilience to climate change; that contribute to the development and implementation of Union policy on climate change adaptation, including mainstreaming across policy areas, in particular by developing, testing and demonstrating policy or management approaches, best practices and solutions for climate change adaptation, including, where appropriate, ecosystem-based approaches; that improve the knowledge base for the development, assessment, monitoring, evaluation and implementation of effective climate change adaptation actions and measures, prioritising, where appropriate, those applying an ecosystem-based approach, and to enhance the capacity to apply that knowledge in practice; that facilitate the development and implementation of integrated approaches, such as for climate change adaptation strategies and action plans, at local, regional or national level, prioritising, where appropriate, ecosystem-based approaches; and that contribute to the development and demonstration of innovative climate change adaptation technologies, systems, methods and instruments that are suitable for being replicated, transferred or mainstreamed. See also the LIFE section of the DG Climate Action web-site.

Financial Instituions may contact the EIB to receive grant funds and long term loans for the financing of retrofit projects according to the EuroPHit standard under LIFE. European Structural and Investment Funds

http://ec.europa.eu/regional_policy/what/future/index_en.cfm

Under the new Cohesion Policy there are different topics of climate change mitigation which also cover building retrofits. The cohesion policy comprises **5 Structural and Investment Funds**: the European Regional Development Fund (ERDF), the European Social Fund (ESF), the Cohesion Fund, the European Agricultural Fund for Rural Development (EAFRD), the European Maritime and Fisheries Fund (EMFF). The ERDF and the Cohesion Fund are the Funds with the greatest focus on energy efficiency in buildings and in the built environment in general**.** Countries could propose to the EU to use the cohesion funds to implement EuroPHit projects as model cases. EU Cohesion Policy investments from 2014-2020 will make more than €38 billion available to support the shift to a more environmentally-friendly economy through investments for energy efficiency and renewables.

6.2.4 ERDF

The ERDF is the biggest single source of EU funding for reducing disparities in terms of development (per-capita GDP), productivity and employment across the EU. All regions in Europe will receive funding from the ERDF. National and regional authorities establish their own development programs and select the projects to be financed. Under the proposal, regions would have to concentrate ERDF support on a limited number of objectives in line with the Europe 2020 strategy which with the help of the Fund will be turned into practical action.

The ERDF will channel resources towards energy efficiency and renewables, innovation and support for small and medium-sized businesses (SMEs). The ERDF can co-finance national, regional and local schemes related to, for instance, the insulation of walls, roofing and windows and replacement of old boilers. There is no additional funding; therefore **this measure requires a shift in the priorities set at regional level.** It is up to MS and regional authorities to decide whether to make use of it or not.

6.2.5 Financial incentives supporting EPBD recast objectives

Financial incentives supporting Energy Performance of Buildings Directive (EPBD) recast objectives (Article 10, Directive 2010/31/EU)

http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32010L0031:EN:NOT, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32006L0032:EN:NOT, http://ec.europa.eu/energy/efficiency/end-use_en.htm

EPBD: Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings. Article 10 of Directive 2010/31/EU (EPBD recast) requires for Member States to outline the existing and proposed measures and instruments including those of financial nature, which promote the objectives of the Directive. Member States can communicate these lists through the Energy Efficiency Action Plans (EEAP) referred to in Article 14(2) of Directive 2006/32/EC.

The existing and proposed measures listed by Member States "may include, in particular, measures that aim to reduce existing legal and market barriers and encourage investments and/or other activities to increase the energy efficiency of new and existing buildings, thus potentially contributing to reducing energy poverty. Such measures could include, but should not be limited to, **free or subsidised technical assistance and advice, direct subsidies, subsidised loan schemes or low interest loans, grant schemes and loan guarantee schemes**. The public authorities and other institutions which provide those measures of a financial nature could link the application of such measures to the indicated energy performance and the recommendations from energy performance certificates."

The Commission shall examine the effectiveness of the Listings for Article 10 of Directive 2010/31/EU in supporting the implementation of the Directive. The Commission's examination and possible advice or recommendations may be included in its report on the National Energy Efficiency Action Plans. Upon request, the Commission shall assist Member States in setting up national or regional financial support programs that help increase energy efficiency of buildings, but mainly existing buildings, by supporting the exchange of best practice between the responsible national or regional authorities or bodies.

The National Energy Efficiency Action Plans and Separate Listings for Article 10 of Directive 2010/31/EU are available at http://ec.europa.eu/energy/efficiency/end-use_en.htm

6.2.6 European Energy Efficiency Fund (EEE-F)

http://www.eeef.eu/home.html

http://ec.europa.eu/energy/eepr/eeef/eeef_en.htm

The European Energy Efficiency Fund (EEE-F) is a public-private partnership dedicated to mitigating climate change through energy efficiency measures and the use of renewable energy in the member states of the European Union. It focuses on financing energy efficiency, small-scale renewable energy and clean urban transport projects targeting municipal, local and regional authorities and public and private entities acting on behalf of those authorities. The EEE-F was established in 2011 with a volume of € 265 million, with funding coming from the European Union, the European Investment Bank, the Italian Cassa dei Depositi e Presititi and Deutsche Bank. The fund provides debt, equity and guarantee instruments, as well as technical assistance grants to support project development. Around 70% of the funding is intended for energy efficiency projects, with the remainder allocated to renewable energy and clean urban transport. The fund aims at bringing already well-proven technologies to the mainstream, and at strengthening the European ESCO market and the use of energy performance contracting.

EEEF pursues its environmental goals by offering funding for energy efficiency and small scale renewable energy projects. The Fund observes

the principles of sustainability and viability, combining environmental considerations and market orientation. It does so by financing economically sound projects, allowing for a sustainable and revolving use of its means.

Beneficiaries of the Fund are municipal, local and regional authorities as well as public and private entities acting on behalf of those authorities, such as local energy utilities, Energy Service Companies (ESCOs), district heating combined heat and power (CHP) companies or public transport providers. Hence, there has to be a direct or indirect municipal link in the project. This can be achieved either by a direct involvement of a municipality (e.g. building owner, investor) or by a long-term contract between the municipality and a third party (e.g. concession for public transport, Energy Performance Contract (EPC) for a public building).

6.3 Social Aspects of Retrofit Projects

6.3.1 Solution approaches for Home Owner Associations

The issue of hold up of energetic retrofit especially concerns apartment blocks, where the privately-owned property of a particular flat is connected to a pro rata share of the shared property (common property). Occupants bear financial responsibility for their own special property. Each property owner must pay a share of the costs incurred to manage the common property. In the 'new EU Member States' this kind of property is proportionally very high due to the former state-owned housing situation.

The main barriers to energetic retrofit in case of joint home ownership are:

- Energy efficient retrofit of single units in an apartment block need to include investments in common property like the heating system or the outside walls

- Most energetic relavant parts of the building are common property (roof, façade, heat generation and distribution). Statutory regulation of associations do not permit an individual owner to do substantial retrofit of his flat (except e.g. internal insulation). Instead, any substantial retrofit decision requires the majority of all associates

- Statutory regulation of renovation cycles normally do not include energy efficiency investments

- Ambiguities in the legal standing of joint home ownerships. There are uncertainties related to tenant-owner issues and building ownership

- Associates have various interests in their property and financial conditions. Lengthy and cumbersome decision-making due to a large number of decision makers. One critical aspect is that owner benefit in different degrees from the retrofit (owner living in an attic flat benefit more from an roof insulation than the rest; owner living in their flat have a direct return of their investment whereas owner being landlord are facing the investor-tenant dilemma)

- Decisions depend on the socio demographic situation of the owner community, the knowledge of the costs and benefits of energetic retrofits and the interests and motivation of the home owners.

- In the case of properties which are managed by housing management companies, steps for renovation are only undertaken with great reluctance, especially if the proportion of rented units is very high. Here, better living comfort and yield (profitability from rental) from energy savings are not always aligned.

Measures and examples to overcome those barriers

Select a viable strategy of building retrofit

- The most viable strategy of building retrofit is a step by step approach of applying the best technologies every time when refurbishment activities are implemented (EnerPhit approach). For each building this requires a lifecycle concept and a long term strategy.
- In a first step encourage flat owners to concentrate on works inside the dwelling - change boilers and windows – do the 'easy' bits first. Internal works are mostly possible. Motivate action within the dwelling alongside other refurbishment (eg kitchen refits).

Ease the the decision making process on energy retrofits:

- Conduct a detailed review of the energy saving and mortgage laws regarding the minimum requirements of energetic retrofits
- Include energy efficiency investments in the statutory regulation of renovation cycles.
- Review the consent barrier and reduce the situations in which consent to reasonable requests can be turned down. Some countries have in their by-laws regulating home owner association statutes a consent barrier of more than fifty percent (e.g. 75 percent) which practically made retrofit impossible. To ease a vote in favor of energetic retrofit, e.g. Germany has reduced this barrier to fifty percent.

- Use of dispute resolution procedures. Introduce mediating structures

- In France retrofit decisions have to be voted by the majority of owners, it takes generally up to 5 years between the first energy audit and the start of retrofit works on site.

Introduce mandatory retrofits in the respective legislation:

- In France and Germany the energy transition law makes is mandatory to insulate walls if a render renewal is needed.

Motivation and information of the owners on the financial viability of energy efficiency measures:

- Promote awareness of benefits of energy efficiency measures. Promote guidance on cost-benefit of energy efficiency measures during retrofits. Better energy efficiency substantially increase the value of the property and it has been the main factor in convincing owners.

- Energy audits can help to provide this information. For example in France energy audit are mandatory for co-owned buildings of more than 50 dwellings before 2017

- Enable landlords/owners to carry out retrofit measures and to recover the costs of energetic retrofits.

Provide public financial incentives and loans and promotional programs to finance energy efficient retrofits:

- In France there is a specific public loan available for home owner associations (Eco Pret a Taux Zero Collectif)
- In Germany, member of a home owner association doing energetic retrofit of the complete building might choose between a low interest loan or an investment grant up to 30 percent (max. 30.000 EUR per flat) of the eligible cost.
- In some East European countries, where many apartment blocks are privatized public buildings in poor physical considition, retrofit might only be possible with substantial financial and technical support by the Government.
- Provide central government funded support (eg legal and practical advice; advice on dealing with mortgage providers) to block owners and tenants who do want to proceed with works but may be put off by the legal barriers.

6.3.2 Solution approaches to the owner-tenant dilemma

In the case of properties which are managed by housing societies, the residents need to accept the retrofits, because it is mandatory. Sometimes steps for renovation can be only undertaken with great reluctance, especially if the proportion of rented units is very high. Here the yield (profitability from rental) is often of greater importance than better living comfort. In Germany, statutory regulation of renovation cycles normally includes energy efficiency investments.

According to current law in Germany, only modernization costs can be allocated to the tenants. The rent increase is 11% per year, based on the costs of energy-efficient renovation, and that can be very expensive for the tenants. The problem is that the rent increases often much higher than the amount the tenant saves by reducing the energy bill and many families can no longer afford the rent. In many cases and under pressure, some families start looking for homes with cheaper rent to move as soon as possible. During the retrofit, some residents also take the opportunity to move for other reasons than the rent increase (preference for a larger home, preference for a smaller house etc.).

The socioeconomic profile of the residents/tenants are often socially and culturally diverse, there are engineers and teachers as well as persons with low-income or in a situation of financial instability/unemployment. There are also many residents with a migration background. So, before starting a retrofit, the companies should analyze if the residents could afford the new rent and continue living there.

Obviously not everyone voluntarily accepts the retrofit. A minority doesn't approve the results and sees no personal benefit in the retrofits. Despite the problems, the overall outcome of modernization with investments in energy efficiency is positive and most residents are satisfied with it. The wide acceptance of retrofits depends on the following factors:

- The houses become more beautiful after the retrofit. This improves the building image, there is more demand to live there and the value of the house rises;
- A reduction of costs in the energy bill (lots of locals don't know how much energy they can save by retrofitting the house, so many are surprised with the outcome);
- With modern installations, the feeling of comfort increases. For example, the house receives often façade insulation, new windows, new heating, new electrical installations and the bathroom is renovated. The surrounding area, for example, gets a place for bicycles or becomes clearer, with

proper lighting and a vegetation type that enables locals to visualize all the corners in case of problematic neighborhoods.

According to the interviews, all the respondents believe that the locals are not firstly interested in thinking about energy efficiency terms because of the environment, but to save money by reducing electricity bills.

6.3.3 Recommendations for new projects

Constant information strategy by different means:

- The ideal is to start informing as early as possible. It is important that both parts speak to each other and the owners explain the tenants what is going to be done, how long it will take and how much it will cost. Unfortunately, owners often simply begin to retrofit the house without contacting the tenants beforehand.
- Continuously inform residents through big meetings, small meetings, informal conversations, leaflets, web sites etc; personally explain the reasons for retrofit and clarify any doubts. The residents should be constantly informed about what was going to happen, with the further plannings for the next years.
- Show projects to residents of houses/buildings in the neighborhood that have been renovated so that people have an idea of how their home will look like after the refurbishment. Some Housing companies also present the results of their projects to the press, to disseminate knowledge and to arouse the interest of future clients.
- Information should be shared with the neighbors and friends network to make sense: in the beginning many residents cannot imagine what the results of the retrofits would be. For example, many residents of one settlement in Frankfurt believed that the ventilation system would make a lot of noise, but changed their minds when they saw that it had functioned smoothly in the neighbor's house. Moreover, when they saw that the neighbor's house was more beautiful after retrofit, many people were excited about the refurbishment of their homes.
- If the residents are immigrants, language barriers have to be considered as these people sometimes don’t want to say anything because they feel ashamed. It is important to think about how to get them to participate more in the process.
- Professional advice: if the communication between tenant and owner no longer works, then it is preferable to contact a third party to take care of the situation (a Tenant association for example).

Consider locals/tenants as an important part of the retrofit process

- Understand the needs of each family, go to their houses and observe how families live and what they want, considering that refurbishments cannot be planned without entering the houses and without consulting the residents beforehand. Address the families from the perspective of the family routine, and not only through the architectural and technical aspects of the homes. Listen to the locals and understand how the retrofits will affect the routine of the residents in the future (the way people walk through the house or sit down at the table etc.). For example, sometimes it is something very easy to fix, like putting an awning on the front door of the house so that people will not get wet in the rain while carrying the shopping bags and trying to find their house keys;
- Take the suggestions and criticisms of the residents into consideration in the project and understand that locals live there, not the builders, so they know better what they want. In the case of one settlement in Frankfurt, in the original plan from the company responsible for the project the garbage containers would be placed inside the buildings, which was refused by the residents fearing unpleasant odor. The company tried to argue that it would not stink due to the ventilation technology, but the locals insisted and the company respected their decision. In the case of another company, when existing homes are retrofitted, residents have the option to choose the colors they want in their homes, as the color of the tile, but not to decide on the technical aspects. When it comes to new

constructions, a residents' committee has the opportunity to influence the planning phase, i.e., the construction plan, technical part, installations etc.

- During the retrofits, there are many problems regarding the residents who remain in the house all day long, like shift workers, families with young children, and elderly residents with health problems, who would have to live for a month with dirt, noise and bricklayers. These people cannot go to the bathroom while it is being renovated. For elderly or sick residents, some companies have a team of social management that takes them out of home on days when there is more noise and brings them back at night. Or there is always the possibility of offering a few days in a hotel.

For each problem some companies try to find an individual solution: For example, for residents with health problems that remain indoors all the time, the company could provide one house in the settlement with some furniture so the family moves there for four weeks during retrofit.

In the case of one settlement in Frankfurt, other minor problems were identified and solved, such as:

- In the retrofit, the windows of the houses were enlarged. For residents who complained that they could no longer hang their curtains, because the curtains were now very small, the company responsible for the project gave them new ones;
- For residents who could not drag the furniture alone before the retrofit began, the company sent people to help them;
- For families who complained that they had no room to store their stuff during the retrofit, the company provided some packing boxes;
- If the bricklayers broke something in the house during the retrofit, the company quickly sent someone in house to repair it (without bureaucracy).

Establish confidence between the company and the residents:

- Just implementing a good information policy is not enough, one must comply with the agreed points and act according to the law. It is very important that each party (tenants and owners) hold on to their rights and obligations, acting fairly by the rules.
- To ensure that residents are always well informed, the company needs to build an office on site and provide someone to answer questions when needed. From the beginning to the end of the process, the same company employees group should accompany the retrofits and communicate with the locals. The company employees should be all the time with the residents, listening to their suggestions and problems and answering questions, establishing a relationship of trust with them.
- It is important to believe the locals, for example if they say they are sick and need a replacement home during the retrofit, not to ask for a medical certificate and try to solve problems personally (not written).
- Show that the company understands the problems of each family and treats each case as an individual one, but the decisions on each case must be consistent and fair, because no family should get more than the others. The trust makes the convincing process easier.

6.4 Technical Criteria of a Financing Program

The following draft proposal for a financing program by development financial institutions (DFI) and implementing commercial financial institution (CFI) to improve the energy performance of residential buildings by a step-by-step refurbishment and integration of renewable energies according to the EnerPHit standard may serve as an example and as a basic concept for the application of financial instruments.

The program should be suitable for everyone who wants to substantially reduce the energy consumption of an existing building. The program should provide long-term financing for investments in building retrofit and in energy conservation in old buildings.

Who is eligible to apply? Everyone investing in owner-occupied or rented residential buildings. In general, these are the owners and land lords, for example: private individuals, home owners, joint home ownerships, housing companies, housing cooperatives, operators of residential establishments, municipalities, municipal associations, other bodies and institutions incorporated under public law.

Contracting projects and district heating companies are also eligible for financing.

What may be co-financed? Funds are made available for measures in residential buildings. These are buildings whose primary purpose is residence, including homes for the elderly and nursing homes. Funds will not be available for holiday homes, cabins or cottages.

Energy efficiency investments are expected to be refinanced by energy savings over the life cycle of the measure. The energy cost savings will help the building owner pay back the loan which is in the interest of the DFI and CFI. Financing programs should thus focus on cost optimal measures i.e. component qualities (e.g. insulation thicknesses) with the highest net profit over the life cycle. Fortunately these cost-optimal measures generally also result in very high energy savings [AkkP 42], which is in line with the goals of the financing programs to generate the highest possible CO_2 emission reductions. Additionally building owners and occupants profit from the revenue generated by the energy saving measures as well as from optimal thermal comfort.

The EnerPHit standard for retrofit with Passive House components offers a guideline for cost-optimal component qualities with high energy savings. It can thus be used as a benchmark for financing programs. It includes specific quality requirements for seven climate zones which cover the whole globe. Such a predefined standard simplifies the process of setting up rules and requirements for financing programs considerably. The current EnerPHit criteria can be found at www.passivehouse.com. **Figure** 11 is an excerpt from the criteria and shows an overview of the component requirements. If use of renewable energy sources is also to be financed, the EnerPHit standard offers a system of 3 classes (EnerPHit Classic, Plus, and Premium) depending on the amount of renewable energy generated as well as the efficiency of the mechanical and electrical systems. Buildings that achieve the classes Plus and Premium could be rewarded with extra financial aids.

Climate Zone according to PHPP	Opaque envelope[1] against...				Windows (including exterior doors)				Ventilation	
	...ground	...ambient air			Overall[4]			Glazing	Solar load[5]	
	Insu-lation	Exterior insulation	Interior in-sulation[2]	Exterior paint[3]	Max. heat transfer coefficient ($U_{D/W,installed}$)			Solar heat gain coefficient (g-value), only if active heating present	Max. specific solar load during cooling period	Min. heat reco-very rate[6]	Min. hu-midity re covery rate[7]
	Max. heat transfer coefficient (U-value)			Cool colours							
	[W/(m²K)]			-	[W/(m²K)]			-	[kWh/m²a]	%	
Arctic	Deter-mined in PHPP from project specific heating and cooling degree days against ground.	0.09	0.25	-	0,45	0,50	0,60	U_g - g*0.7 ≤ 0	100	80%	-
Cold		0.12	0.30	-	0,65	0,70	0,80	U_g - g*1.0 ≤ 0		80%	-
Cool-temperate		0.15	0.35	-	0,85	1,00	1,10	U_g - g*1.6 ≤ 0		75%	-
Warm-temperate		0,30	0,50	-	1,05	1,10	1,20	U_g - g*2.8 ≤ -1		75%	-
Warm		0.50	0.75	-	1,25	1,30	1,40	-		-	-
Hot		0.50	0.75	Yes	1,25	1,30	1,40	-		-	60 % (humid climate)
Very hot		0.25	0.45	Yes	1,05	1,10	1,20	-		-	60 % (humid climate)

Figure 11: EnerPHit component requirements by climate zone [PHI 2015]

For stepwise retrofits it is, however, not sufficient to just set specific individual component requirements as eligibility criteria for financing programs. Cost optimality as well as the full energy savings potential can only be achieved, if all single measures are coordinated well, even if they are implemented at very different points of time. For this purpose the concept of an overall retrofit plan (ORP) has been developed in the EuroPHit project. The ORP can be set up by an architect, certified Passive House Designer, or energy consultant before the first renovation step is carried out. It contains the definition of all expected future steps. Upcoming steps are described in detail whereas steps that will be carried out in the more remote are only defined schematically. Interdependencies between different steps are investigated with the help of a checklist and solutions are worked out. An energy balance calculation with the Passive House Planning Package [PHPP] shows the expected energy savings for each step. Such an ORP can also help avoid drastic structural damage (e.g. mould growth) sometimes associated with careless retrofit measures.

Figure 12: EnerPHit Plus seal

With a thoughtfully elaborated ORP chances are very good that the desired energy standard and the associated benefits will be fully achieved once the last retrofit step has been implemented. Thus a comprehensive ORP is recommended as a basic eligibility criterion for financing programs. As an additional security for DFIs and CFIs as well as the building owners the EuroPHit project has developed a precertification scheme for stepwise retrofits to EnerPHit (or Passive House) Standard. Precertification includes a thorough check of the ORP. Once the first bundle of energy efficiency measures has been carried out and has gone

through quality assurance the precertificate is issued. Quality assurance can be continued for future steps. After the last step has been implemented and checked, the full certificate can be issued. Precertification and certification for stepwise retrofit to EnerPHit (or Passive House) Standard can be carried out by Passive House Institute or one of its international accredited certifiers (see www.passivehouse.com).

References:

AKKP 42, 2013 Proceedings of research group on cost effective Passive Houses 42, Economic assessment of energy efficiency measures, Passive House Institute, Darmstadt 2013 (in German).

PHI 2015: Criteria for the Passive House, EnerPHit and PHI Low Energy Building Standard, Passive House Institute, Darmstadt, Germany, 2015 (at time of writing English version only available as draft)

PHPP Passive House Planning Package (PHPP), Passive House Institute, Germany, 1998-2015. Available at www.passivehouse.com

7 INDEX

Technical References

Project Acronym	EuroPHit
Project Title	Improving the energy performance of step-by-step refurbishment and integration of renewable energies
Project Coordinator	Jan Steiger Passive House Institute, Dr. Wolfgang Feist Rheinstrasse 44/46 D 64283 Darmstadt jan.steiger@passiv.de
Project Duration	1 April 2013 – 31 March 2016 (36 Months)

Deliverable No.	EuroPHit_D4.4_FinancialGuidelines
Dissemination Level	EU
Work Package	WP4 Financing step-by-step energy efficient refurbishment
Lead beneficiary	Building Research Establishment Ltd (BRE)
Contributing beneficiary(ies)	IzN e.V.
Author(s)	Georg Kraft, Dr. Klaus Stocker, Dr. Rudolf Hennes Friedrichsdorfer Institut zur Nachhaltigkeit (IzN) e.V. In der Lach 9 61381 Friedrichsdorf www.izn-friedrichsdorf.de
Co-author(s)	
Date	22.09.2015
File Name	EuroPHit_D.4.4_AppraisalGuidelinesForRefurbishments_Detailed_PHI