EuroPHit

D4.4_Appraisal Guidelines for Energy efficient refurbishment including RES and special financing models for step-by-step refurbishment and recommendations

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]

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Introduction

This document provides a summary of guidance developed by the EuroPHit project to support commercial lending institutions seeking to: gain sustainable energy (SE) finance experience; and develop SE capacity and activities in-house in order to finance retrofit of building stock.

An overview of financial models available for SE efficiency-driven projects is provided, along with a description of the opportunities to combine commercial market financing with various grant programmes provided by the European Union.

Ways to address energy efficiency as part of the assessment of the financial soundness of a project are outlined, along with recommendations for the development of a finance programme which can be used for step-by-step energy efficiency refurbishments.

The full document *Financing of Sustainable Building Retrofit: Guidelines for Financial Institutions* is available from the EuroPHit website – www.europhit.eu/

The full guidelines aim to assist financial institutions by providing a clearer picture of the EU funding system and support for the design of special financial tools and financing programmes. They also provide the necessary information for presenting financing proposals to the decision-making hierarchy within banks or to apply for promotional refinancing from National Promotional Banks and the EU.

The guidelines were 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 programme “Intelligent Energy – Europe”. More details on this programme, and descriptions of all other projects, are available on http://ec.europa.eu/intelligentenergy.

The EuroPHit project

The overall objectives of the EuroPHit project are the promotion of energy efficiency in existing buildings and the reduction of energy consumption and greenhouse gases. These are achieved by reducing the energy demand of buildings, reducing consumption of fossil fuels and electricity, use of renewable energy and implementation of refurbishment measures.

The project is based on the premise that the most viable strategy of building retrofit is a step-by-step approach, applying the best technologies every time refurbishment activities are implemented. In order to achieve this, buildings will require a whole life strategy. The EuroPHit project is focused on, and promotes, EnerPHit, one of the most stringent and integrated standards available internationally for energy retrofits. The EnerPHit Standard is itself based on the Passivhaus methodology, which is now a well-established approach to the design and delivery of energy-efficient buildings, with over 20 years of successful implementation.

An integral component of the EuroPHit project is to inform and stimulate financial institutions to support the EuroPHit project by providing access to credit-lines and promotional finance models, based on existing EU programmes.

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EuroPHit_CS.16_ Single family Home Centón © LaMP

Background

Buildings account for nearly 40% of total energy consumption in the EU. With more than 200 million buildings in need of energy efficiency measures, the majority will require deep retrofitting if the EU's 2020 carbon emissions targets are to be met. A large proportion of the energy requirement of buildings is used in heating and cooling. Deep retrofit, by improving the building envelope and applying Passivhaus standard energy efficiency and ventilation solutions, can reduce the energy requirements of the worst performing buildings by 80% or more.

The EU has introduced legislation to ensure that buildings require 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 to higher energy performance standards contributes to the reduction of energy demand and the lowering of greenhouse gas emissions. For building owners, energy-saving refurbishment is most cost-effective when it is incorporated as part of the maintenance and renovation cycle, in other words, combined with already planned modernisation or maintenance works.

Such retrofits can either be done in a single intervention or incrementally in a step-by-step manner. Step-by-step retrofit – as proposed by the EuroPHit project - constitutes the most appropriate approach in most cases, both from the building perspective (modernisation where and when needed) and from the point of view of property owners with limited resources. Significant reductions in energy consumption have been demonstrated in many successfully completed retrofits.

Building retrofits generate energy cost savings over the life cycle of the investments, therefore long term financing is needed. Developing an appropriate finance strategy is the first step in

the provision of a suitable package. Financial institutions are in a key position to assist their clients through access to low cost capital and to grant funds provided by the EU or by national, regional or local government. Governments are also able to incentivise retrofit projects through their own grant funds.

It should be noted that the refurbishment of the building stock provides an opportunity to create local jobs, stimulate and regenerate local and national economies and, at the same time, contribute to national carbon reduction targets. For example, in Germany, the programmes for energy-efficient construction and refurbishment receive favourable terms through German federal budget funds which provide financial incentives for energy efficiency improvements in the housing sector. The promotional programmes are handled by the Kreditanstalt für Wiederaufbau (KfW) on behalf of the Federal Government**.** Recent studies show that, in Germany, deep retrofit of buildings is a win-win situation for the home owners, the environment, the economy and the federal budget[1].

EuroPHit_CS13_ Tommerupvej 8B_before retrofit (above), after retrofit (below) © Passivhus.dk

[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/

1 Financing sustainable energy investment in buildings

Although there is national and international financing support for energy efficiency via grants, subsidies etc, it is unlikely that 100% of the cost of an energy efficiency project will be publicly funded. Most, therefore, combine market-based financial instruments (loans and equity) with public instruments.

1.1 Market-based financial instruments

There are various forms of financial instruments available for energy efficiency retrofit schemes:

- **Debt financing, credit lines, revolving funds, preferential loans:** these might include conventional bank loans with either principal or annuity repayment (loan maturity would typically match the actual payback time of SE projects);
- **Project finance:** used where the project is financed on the basis of its own merits, rather than that of the project partners. Lenders would want to ensure that the cash flow would be sufficient to cover the repayments;
- **Recourse (balance sheet/ secured) finance:** loan granted on the basis of the credit-worthiness of the investor (and usually supported by collateral). Organisations such as energy services companies (ESCOs), with few assets, must often use the equipment provided to their customers as assets;
- **Energy Performance Contracting (EPC) and ESCO financing:** an EPC is an integrated contract in which a partner (such as an ESCO) designs and implements energy efficiency measures with a guaranteed level of performance for the duration of the contract. Energy cost savings are used to repay the upfront investment costs. EPCs shield the client from performance risk and enables upgrades to be paid for immediately. However, establishing an EPC is a complex process and is mainly suitable for large scale or bundled projects;
- **Forfaiting:** selling a receivable for a discounted lump sum to a bank, normally on the basis of bills of exchange. In the case of an ESCO, in an EPC with an end-user, the ESCO would sell future receivables (ie the end-user payments) to the bank. The bank would then assume the credit risk in return for a discounted one-time payment;
- **Leasing:** obtaining the right to use an asset, rather than the possession of this asset. Finance leasing can be used for energy efficiency equipment, even when the equipment lacks capital value.
- **Vendor financing (equipment supplier/vendor credit):** many general equipment manufacturers have established financing relationships. Utilities can be important partners or originators for energy efficiency equipment loan financing, with collections of finance payment potentially made through utility bills;
- **Export finance:** this is related to vendor financing and occurs when one of the parties is situated in a different country;
- **Project bundling and larger projects:** achieving scale is a critical issue for any new business, but is particularly acute in the energy efficiency finance marketplace. Individual

projects, technologies, service offerings and investments can be aggregated to make a more interesting offer for ESCOs financial institutions.

1.2 Public Sector Support

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

- **Grant programmes:** these are provided by the EU and state governments to support the upfront cost of innovative energy efficiency investments that may entail long payback periods. Public grant programmes are used in all EU member states to support SE projects which contribute to energy and social policies and meet other public policy goals, such as increased employment;
- **Credit lines and guarantee schemes:** these are available in a number of countries and have typically been established by the Development Financial Institutions;
- **Redemption grants:** in the case of a step-by-step retrofit, such as that in the EuroPHit project, a repayment bonus, financed from a redemption grant, can be used in connection with a loan to reward the borrower when certain energy efficiency performance targets have been achieved;
- **EU funding sources:** these are often provided in the framework of a national programme and are awarded by tenders or by special programmes and projects. Relevant programmes include those offered by the Commission Directorate Generals for Energy and Environment, as well as the Horizon 2020 programme, European Structural and Investment Funds and the Intelligent Energy – Europe programme;
- **National and regional schemes for individuals, social/municipal housing, residential and non-residential buildings:** a range of schemes are available at a national or regional level;
- **Funding programmes run by European Development Financial Institutions** (e.g. the European Bank for Reconstruction and Development (EBRD).

As the 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 making them available to project proponents by on-lending via commercial banks.

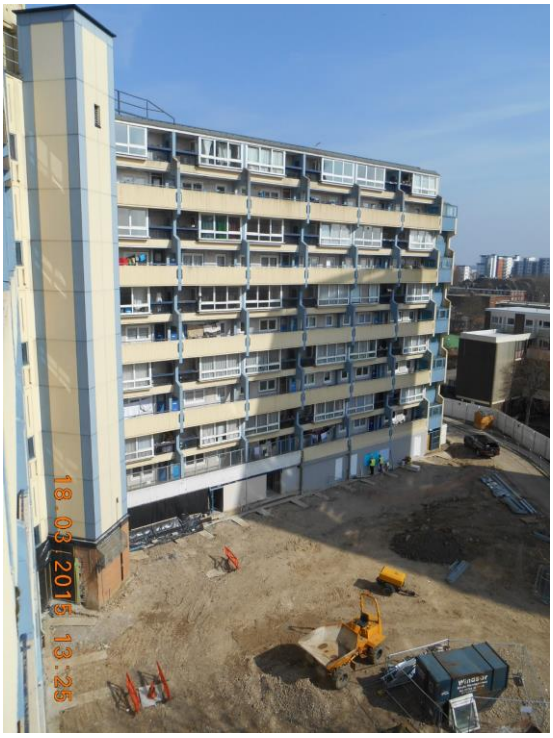
If grants are available to support the implementation of financing programmes then they could be used:

- for technical assistance to the borrowers (to pay for energy advisors);
- to pay for technical advice on financing of retrofit programmes;
- to finance a redemption grant, rewarding the achievement of certain energy efficiency targets which would need to be confirmed by qualified energy advisors;
- to reduce the interest rate and soften the loan conditions.

2 Barriers to investment in energy efficiency and sustainable energy

There are a range of barriers to sourcing financial investments for SE efficiency-driven refurbishment of buildings. These include market barriers and failures, as well as legal barriers, including those around joint home ownership in residential buildings.

The EU has identified the following as some of the key barriers to financial investment in sustainable energy in buildings, including energy savings (energy efficiency) and renewable energies[2].



Portsmouth City Council © BRE

EuroPHit_OP20_House Saint Cyr au Mont d´Or Single family house © LaMP

EuroPHit_CS14_ Wilmcote Multifamily House in

2.1 Market barriers and failures:

Costs

- High pre-investment development and transaction costs partially due to small size of projects, esp. in the residential sector;
- Even where payback periods are short and economic benefits are clear, SE projects are often not implemented because of high upfront costs;
- Lack of consideration of SE measures life cycle costs at procurement stage.

[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

Information failure

- For customers: lack of awareness, and therefore a very high perceived risk, of new energy efficient technologies;
- Commercial Financial Institutions (CFIs): general lack of SE finance experience, and 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.

Uncertainty over levels of energy savings

- Mistrust in energy audits, with benefits initially invisible;
- Energy savings as revenue not taken into account by financiers: cash flows from saving energy are not (yet) considered in the same way as conventional revenues;
- Lack of reliable long term forecasting regarding the development of the energy prices, which prevent the savings calculations for repayment of long term credits.

Financial risk

- 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.

Sectoral issues

- Rental sector: split incentives between building owners and tenants;
- Residential sector: long payback periods, lack of contractors, small project size and lack of support for holistic retrofits.

EuroPHit_OP23_Treviana Social Housing in Madrid © PEP

2.2 Legal barriers and barriers in the case of joint 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 ownership

- Ambiguities in the legal standing of joint home ownerships requiring lengthy and cumbersome decision-making due to a large number of decision makers; in blocks of flats, owners' associations need to be involved in line with specific legislation and practices
- Where properties 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 regulations for renovation cycles normally do not include energy efficiency investments.

Rental sectors

- Uncertainties related to tenant-owner issues.

EuroPHit_CS10_EnEffect_ School 8 Municipality of Gabrovo_SiteVisit © EnEffect

Table 1_Financial tools proposals responding to different market barriers and projects ownership.

Market barriers	Private			Public		
	Households					
Projects Characteristics	Multi-apartment buildings	Small Buildings Houses	Companies	Administration buildings	Housing	Other public buildings
Economic model Long payback period High pre-investment development: high proportion of engineering Long life cycle Transactional costs	Grant programs Credit lines Redemption grants	Grant programs Credit lines and guarantee schemes Redemption grants	Forfaiting EPC Leasing	Forfaiting EPC Leasing	Legal frame	EPC Leasing
Financial Risks Energy prices volatility Low collateral asset value Immature economic models Low market density	Guaranteed funds Credit lines Revolving funds Preferential loans	Guaranteed funds Preferential loans	EPC Preferential loans	Standardisation	Standardisation	Standardisation Guaranteed funds
Technological risks Mistrust in energy audits Performance achievement incertitude Equipment momentum	Guaranteed funds Standardisation	Guaranteed funds	EPC	EPC Standardisation	EPC Standardisation	EPC Standardisation
Budgeting characteristics Annual budgets Accounting separation of investment and expenditure	–	–	–	EPC Leasing	EPC	EPC Leasing

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2.3 Project Characteristics

Some of the identified market barriers may have more influence on some projects than others. Despite the wide range of national and international financing support for energy efficiency, deep energy renovations are still hindered by financing issues. The solution is to be found in multiple funding solutions. Most of the successful projects, therefore, combine market-based financial instruments (loans and equity) with public instruments. Therefore when EE objectives are set, final recipients of the potential financial support should be identified. This identification of the building´s ownership will help apply effective solutions.

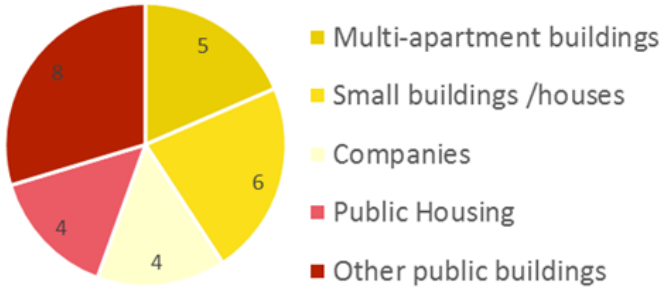

Figure 1_Ownership profile of the different EuroPHit Projects.

The left hand pie shows the ownership shares of the deep energy retrofits undertaken on behalf of the EuroPHit project. Most of our projects are owned by public authorities. Within these projects most of them are educational buildings.

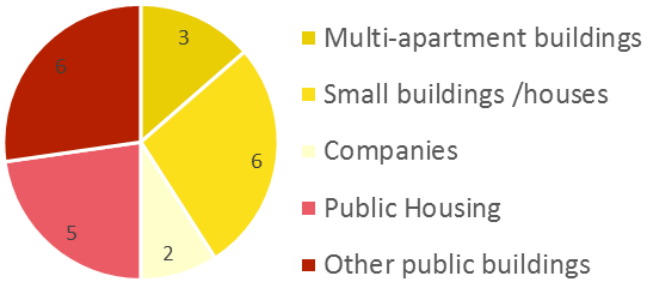

Figure 2_Ownership profile of the EuroPHit projects after cancelled projects clearing.

Even after cancelled projects clearing, Figure 2, public ownership share maintains the first place. That is to say that public investment has played a key role in the EuroPHit project. Still, public buildings do not constitute the main part of the European building stock. According to Ecorys efficiency in the building sector[3], public buildings scale up to only 12% of the European building stock whilst private buildings represent 88% of the total amount.

[3] Ecorys, Resource efficiency in the building sector, Final report for EU DG Environment

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Passive House Institute

3 Design of a EuroPHit financing programme

All retrofit projects requiring financing will need to undertake a number of assessments:

3.1 Cash flow forecast

Cash flow in an energy-efficiency programme is based on the following inflows and outflows:

Inflows	Outflows
Savings from efficiency gains (avoided outflows)	Equity share at investment cost
Loan disbursements	Operational cost
Higher rents (Owners)	Higher rents (Tenants)
	Repayment/interest for loans

Although cash flow data are based on future estimates, investment cost, rent increase, debt service and operational cost can be reasonably accurately predicted. If necessary, lower and upper scenarios can be applied. Savings from energy efficiency improvements, however, are a more complicated issue and the following considerations need to be taken into account:

- The base case values should 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 tenant energy savings by increasing rents.

The profile of cash flow of an energy efficiency project is therefore usually a high initial investment cost, with a distant break-even point and a high level of uncertainty (related to energy prices, technological obsolescence, demand shifts, etc).

3.2 Is the project bankable?

The cash flow is an estimate of an average development, which may fluctuate at any given time. Banks will want to know the extent to which fluctuations are possible. They are likely to consider:

- Real and perceived technological risk: in particular, the quality of design and construction, that expected savings may not be reached, the novelty of technology and previous experience;

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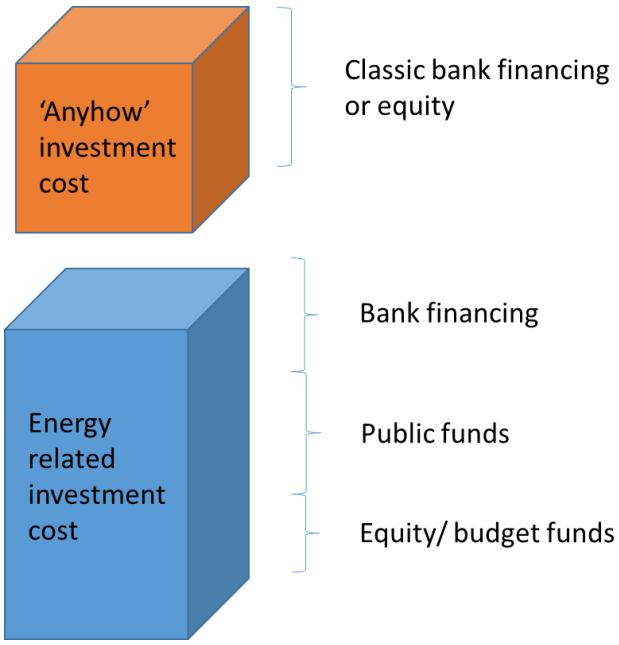
- Financial risk: including cash flow, debt service ratio and other factors, likely price changes, budgeting of energy cost savings;
- The effects of end-user behaviour on projected energy savings;
- Maturity match and country-adapted length of repayment periods;
- Credit-worthiness of the borrower and/ or collateral;
- Participation of public institutions.

3.3 Sensitivity and scenario analyses

To judge the actual risk, sensitivity and scenario analyses should be applied by changing assumptions such as rental income, energy prices, interest rates, etc. An analysis can provide insight into the most influential parameters. 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.

3.4 Separation of 'anyhow' costs

Frequently, buildings undergoing energy-efficiency refurbishment also need other renovation. Indeed, it can often be advantageous to couple energy efficiency improvements with other renovations that are already included in the building maintenance plan. However, as the normal maintenance and renovation costs ('anyhow' costs) will not be recovered through energy savings, the energy-efficiency related cost must be separated from the other refurbishmnent costs, as shown below:



To fund the energy related investment cost, a mix of public and market-based lending sources can be accessed.

To overcome difficulties such as the long repayment periods and externalities, public institutions provide a wide variety of funding interventions, which can be used in combination with

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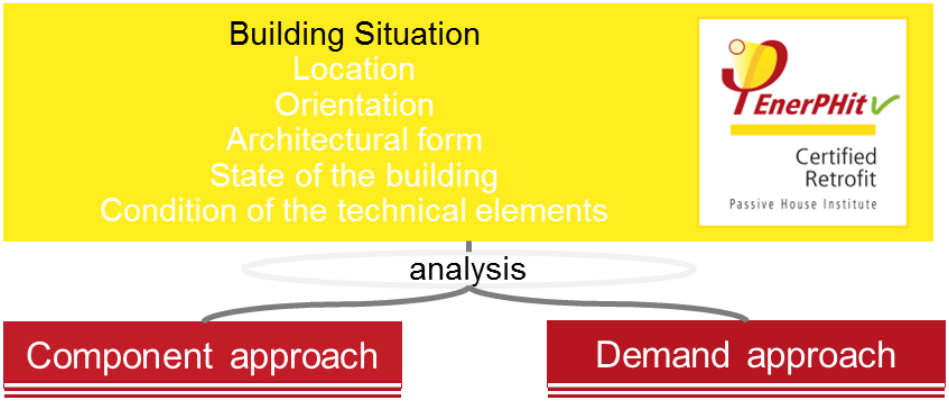
market-based instruments to support retrofit projects. Public funds can also help to aim at 'deep renovation' going beyond minimum energy performance requirements. Externalities, such as economic benefits and GHG-avoidance, play an important role as justification for public subsidies.

For market-based lending, the central concern is solely a sound relationship between investment and operating costs on one side and incoming future cash flow on the other. Energy efficiency investments would be expected to be recovered from energy savings over the life cycle of the measure. Financing programmes should thus focus on cost-optimal measures i.e. component qualities (e.g. insulation thicknesses) with the highest net profit over the life cycle.

One aim of the EnerPHit standard is to provide robust guidelines to identify cost-optimal components which can result in high energy savings. As a consequence, EuroPHit enables lenders to benchmark returns and to design a financing programme for reducing the energy consumption of existing buildings.

EnerPHit Evaluation Process



While the component approach guarantees a certain level of thermal quality through technical requirements, the demand approach assesses the overall energy consumption through a calculation method.

In addition to setting component level performance, EnerPHit also requires an Overall Retrofit Plan (ORP) covering all the anticipated retrofit stages over the long term. To ensure optimal performance on completion, a precertification scheme for stepwise EnerPHit (or Passivhaus) Standard retrofits has been developed. In the case of a step-by-step retrofit (eg a EuroPHit project) 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

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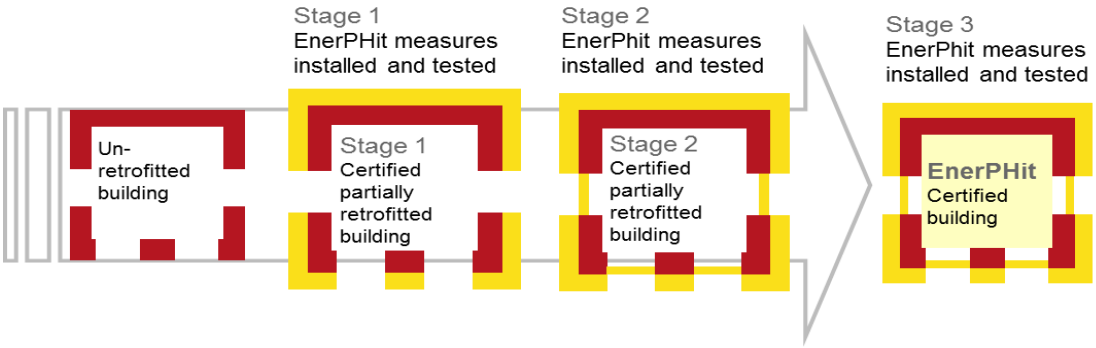
have been achieved. Quality assurance can be continued for future steps. After the last step has been implemented and checked, the full certificate can be issued (see below).



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4 Conclusion/ Recommendations

Any energy efficiency project seeking funding will need to undertake a range of assessments, including cash flow forecast, assessment of bankability, and sensitivity and scenario analyses. It is likely that retrofit of existing buildings will take place in a stage-by-stage approach that coincides with 'anyhow' investment such as existing maintenance or renovation programmes. This stage by stage approach minimises the additional costs associated with the retrofit works and any disruption to tenants/residents. However, 'anyhow' investment costs will need to be separated from energy efficiency costs, as they are not suitable for public financing.

There are a number of barriers to financing retrofit projects, which include high upfront costs, information failure and uncertainty over return on investment. In addition, other barriers, such as rules over public budgeting and ambiguities in the legal standing of joint ownership can also present difficulties in securing funding.

Most energy efficiency projects will require a mix of market-based financial instruments (loans and equity) and public instruments.

Public supports include grant programmes, redemption grants and EU funding streams. For these sources of finance, externalities such as economic benefits and GHG-avoidance play an important role when considering projects for investment.

Market-based financial instruments include debt financing, project finance and specific energy efficiency finance such as EPCs and ESCOs. For market-based support, energy efficiency investments would be expected to be recovered from energy savings over the life cycle of the measure. Guaranteed energy savings make funding of such retrofit works much more attractive to investors and the Passivhaus and EnerPHit standards consistently achieve their predicted energy savings. If these standards are to be delivered in an agreed stage-by-stage approach then each stage will need to be assured/certified for quality. Passivhaus and EnerPHit lend themselves very well to a staged approach because there are many quality testing checkpoints in the process.

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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 programmes 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

Technical References

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