Report
Deliverable 2.5

D2.5 Report on suitable contraction solutions for deep renovations (Task 2.4)

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outphit – Deep retrofits made faster, cheaper and more reliable
outPHit pairs such approaches with the rigour of Passive House principles to make deep retrofits cost-effective, faster and more reliable. On the basis of case studies across Europe and in collaboration with a wide variety of stakeholders, outPHit is addressing barriers to the uptake of high quality deep retrofits while facilitating the development of high performance renovation systems, tools for decision making and quality assurance safeguards. outphit.eu

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Keywords

Energy performance contracting, third party financing, comprehensive building renovation, Financing Energy Renovation in Building, Tenants Engagement, Energy Efficiency, Business Model Design.

“I believe that renovation of buildings to high energy performance standards could be one of the most cost effective investments a nation can make, given the benefits in terms of job creation, quality of life, economic stimulus, climate change mitigation and energy security that such investments deliver”. Oliver Rapf, Executive Director, BPIE

“Every $1 spent on energy efficiency in Iowa produces $1.50 of additional disposable income” United States Environmental Protection Agency.

"We are proud to have implemented the first serial renovation in Germany and to have renovated three comfortable, CO_2-neutral buildings for the owner and the tenants. Now it is up to us to use the experience and data to further develop the serial solution.” Emanuel Heisenberg, ecoworks GmbH

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1. Energy Contracting

Energy Contracting is a service that helps to make buildings more efficient. It facilitates a significant improvement in a building's energy efficiency, benefiting both the owner and the environment. The concept of energy contracting is a method and financial mechanism to support building refurbishment. Energy consumption is reduced by new intelligent building systems and the resulting savings pay for the costs of the renewal. In addition to this, the entire project cycle costs are minimized. Renewable energy solutions can also be added to the contracting concept. They guarantee further Energy Supply Contracting is the efficient supply of energy. The contracting partner provides products such as heat, chilling, compressed air or electricity. The subject of the contract is not the energy value, like for example liters of oil, but the utility value – billed in Euros per volume items of heat, steam or compressed air. Financing, engineering design, planning, constructing, operation and maintenance of energy production plants as well as management of energy distribution are often all included in the complete service package. The ESC is a service primarily used in the commercial and industrial sectors, however residential dwellings may also be included for reductions in primary energy use for a long period and accelerate the return on investment. Contracting is an extensive energy service, provided by an Energy Service Company (ESCO). The ESCO guarantees savings that cover all implied costs. It accepts the operational risks for contracts with durations generally above 5 years and normal time spans of 10-15 years. The ESCO typically offers customized energy contracting packages that contain planning, operation, and maintenance elements. In addition, it also manages energy purchasing and financing of various projects.

1.1 Energy Supply Contracting (ESC) focuses on energy supply

Energy Contracting is a service that helps to make buildings more efficient. It facilitates a significant improvement in a building's energy efficiency, benefiting both the owner and the environment. The concept of energy contracting is a method and financial mechanism to support building refurbishment. Energy consumption is reduced by new intelligent building systems and the resulting savings pay for the costs of the renewal. In addition to this, the entire project cycle costs are minimized. Renewable energy solutions can also be added to the contracting concept. They guarantee further Energy Supply Contracting is the efficient supply of energy. The contracting partner provides products such as heat, chilling, compressed air or electricity. The subject of the contract is not the energy value, like for example liters of oil, but the utility value – billed in Euros per volume items of heat, steam or compressed air. Financing, engineering design, planning, constructing, operation and maintenance of energy production plants as well as management of energy distribution are often all included in the complete service package. The ESC is a service primarily used in the commercial and industrial sectors, however residential dwellings may also be included for reductions in primary energy use for a long period and accelerate the return on investment. Contracting is an extensive energy service, provided by an Energy Service Company (ESCO). The ESCO guarantees savings that cover all implied costs. It accepts the operational risks for contracts with durations generally above 5 years and normal time spans of 10-15 years. The ESCO typically offers customized energy contracting packages that contain planning, operation, and

maintenance elements. In addition, it also manages energy purchasing and financing of various projects. example in a district heating scheme energy supply contract. The business model encompasses the entire process from the purchasing of fuel to the delivery and invoicing of energy. CHP plants and renewable energy solutions frequently are also included in energy supply contracts. The benefits of ESC are a significant boost in efficiency, clear and optimized operational costs, more supply assurance and the usage of the most recent safety standards. The customer no longer needs to worry about their energy supply concerns and, in addition there is an increase in environmental performance. The focus of the ESC service model is on the efficiency of the energy supply with the aim to bring the efficiency to its maximum while at the same time providing security of supply.

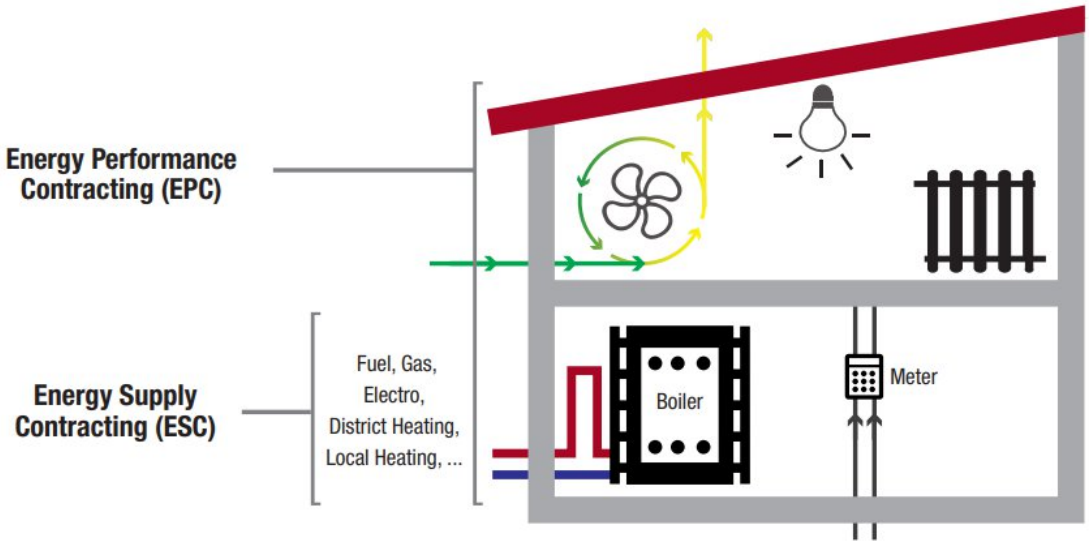


Figure 1: Energy supply contracting

1.2 The energy service value chain

Energy services achieve economic and environmental benefits. Renewable energy solutions such as biomass, wind and solar energy are usually considered in the contracting approach. The energy service value chain shows two different basic models of energy contracting:

- Energy Supply Contracting (ESC) and
- Energy Performance Contracting (EPC) The principal difference is that EPC goes beyond ESC. Whereas ESC is based on a business model that guarantees energy supply; EPC is a business model for energy savings. The goal is to avoid wasting energy and to invest the savings in energy efficiency

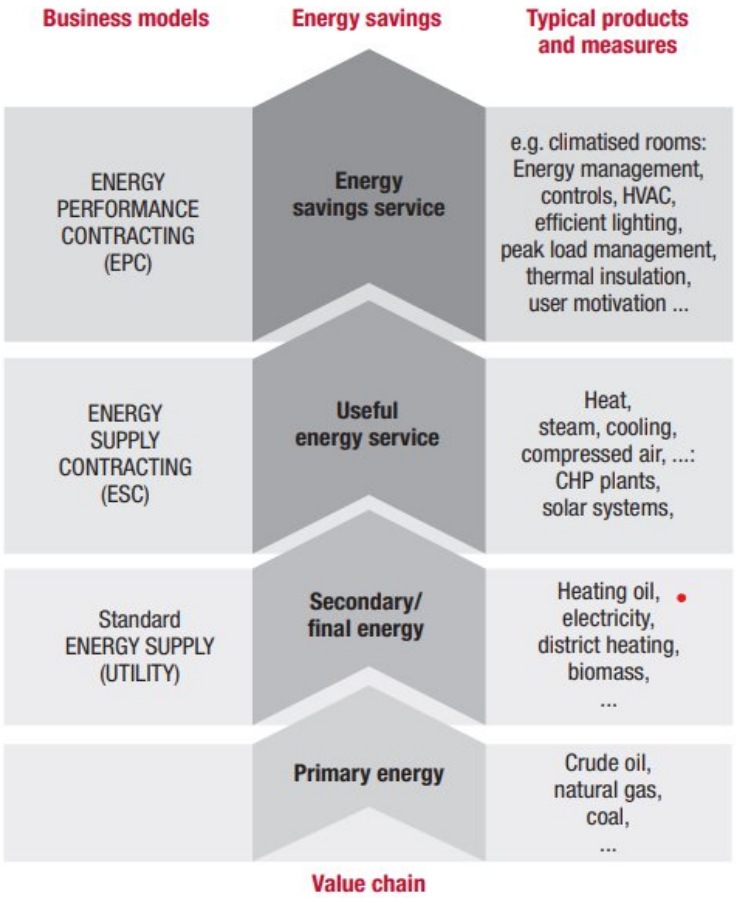


Figure 2: The Energy Service Value Chain

1.3 Energy Performance Contracting (EPC) aims for energy savings

The application span of Energy Performance Contracting involves the entire building – as one incorporated energy consuming unit. It is a type of long terms contractual agreement where the customer benefits from new or upgraded energy equipment and the ESCO's remuneration is directly tied to the savings achieved by the reduced energy consumption. The cost of investment is paid back from the savings, and in case the ESCO fails to achieve that, they must cover the difference between the actual and the guaranteed costs. More than a funding model, an EPC is a program of practical engineered energy efficiency measures that are implemented in buildings to deliver real energy savings such as HVAC, lighting, controls and building fabric improvements. In addition, to ensure the building is used in the most efficient way, building occupants receive training on energy efficiency practices. The intention is to keep the total energy consumption to a minimum – by way of demand side energy efficiency methods.

To ensure promised energy savings have been achieved over the contract duration, a procedure termed "measurement and verification" is used. Adhering to an internationally recognized protocol such as the International Performance Measurement and Verification Protocol (IPMVP), customers

can be assured that guaranteed savings have actually been delivered despite changes to the climate, the building and its use over time.

The procedure is subject to the EPC contract, regulating the partnership between the ESCO and the customer. The contract regulates general issues such as property rights, usage of the systems and partnership duration. In addition, the amount and structure of the investment are determined, its implementation, how it is controlled as well as the maintenance of the energy saving measures which have been taken. It particularly determines the extent and distribution of the annual savings. The key benefits include risk transfer, the ability to modernize a building's energy infrastructure without necessarily having the funds and accessing external expertise. The key focus is on saving energy at the point of use first, before optimizing the supply of that energy.

1.4 reasons for renovation measures through contracting

1. Sustainable contribution to climate and environmental protection
2. Increase in competitiveness
3. Cost Savings and ROI
4. Increase in value of the property
5. Improved comfort
6. High operational safety and reliability

2. OutPHit / Energiesprong

Business model innovations can play a key role in unlocking the potential of systemic innovation. How the radical "Energiesprong" or "OutPHit" business model, based on zero-energy performance contracts, an industrialized supply chain, integrated governance, and a simple customer proposition, could greatly improve the desirability, delivery, and scalability of whole-home energy retrofits.

2.1 OutPHit: nZEB or ZEB even for retrofits

OutPHit is based on Passivhaus/EnerPHit standard. Three labels are actively used: enerPHit Classic, EnerPHit/Plus and EnerPHit/Premium. OutPHit is to develop global retrofit based on EnerPHit standard. In comparison to Energiesprong, there's no financing scheme dedicated to OutPHit/EnerPHit retrofits. However, OutPHit also supports streamlined retrofits to EnerPHit levels.

The main strenght of EnerPhit / outPHit projects is the sound quality assurance in design and execution stage, the reliable energy balance calculation with the Passive House Planning Package (PHPP) and the thorough quality testing with a blower-door-test and the verification of energy balance calculation and execution of the efficiency measures in case of an EnerPHit-certification of the deep retrofit.

Certified EnerPHit projects perform highly reliable with a very low energy consumption, provide high living comfort through comfortable interior surface temperatures and offer superior indoor air quality conditions.

Many of such projects can be found on the Passive House Project Database:
https://passivehouse-database.org/index.php?lang=en

2.2 Energiesprong principle: E=0

Energiesprong is an renovation that intends to achieve an energy efficient renovation through pre-fabrication approaches combined with net-zero energy-approach. It combines good living comfort, minimal renovation times and an innovative financing model with a future-proof energy standard. This is made possible because Energiesprong-refurbished buildings aim to generate as much energy as they need in the annual balance sheet.
The Energiesprong concept represents an attractive offer for industry, the housing industry and residents. Through quality assured pre-fabrication contrast to current practice, an Energiesprong refurbishment guarantees performance improvements over a long-term period of between 10 and 30 years. This gives the owner investment security and the tenant security when reducing their energy costs.

2.3 Energiesprong business model analysis

If we want to develop a business model like Energiesprong or another one, firstly we have to know well and analyze the components of a business model and this Analysis we can find in this table:

	Facilitating – network formation and collaboration	Configuring – business model design	Brokering - advocacy and resource raising
Value proposition	Creating opportunities for new value propositions, by bringing new actors together- supporting and coordinating networks (Hellström et al., 2015).	Configuring the mix of products and services which form the new value proposition (Chesbrough, 2010). Includes testing of alternative value propositions with users, suppliers and regulators.	Advocacy and lobbying to modify regulatory or policy environment to be more favourable to new value propositions.
Supply chain	Creating opportunities for new supply chain interactions - developing the relationship between the core firm/businesses and their suppliers, which can be more complex in the case of systemic innovation (Mlecnik, 2013).	Setting rules and contract terms for suppliers, as well as training and capacity building (Mlecnik, 2013).	Advocacy and lobbying to modify regulatory or policy environment to be more favourable to new supply chain configurations.
Customer interface	Creating new connections to potential customers, interfacing between customer expectations and new business model designs.	Developing marketing and sales channels as well as new forms of customer engagement – including the use of new media (Brown, 2018).	Advocacy and lobbying to modify regulatory or policy environment to be more favourable to new customer interfaces. Creating new markets by influencing regulations or local rules (Martiskainen and Kivimaa, 2017).
Financial model	Creating links to new financial actors to develop new financial models through new sources of capital or revenue streams.	Developing new financial models – often linked to new value propositions, requiring interaction with finance providers and customers.	Advocacy and lobbying to modify regulatory or policy environment to be more favourable to new financial models. Seeking new financial resources such as research and development (R&D) funding or other private sector fundraising activities.
Governance	By facilitating new networks and links between the other business model components this may lead to new modes of governance, towards more integrated or networked arrangements (Treib et al., 2007).	Developing the linkages between different actors involved in business model governance. This may include an active role in organisational management and 'system building' activities during the early phases of business model development (Bolton and Hannon, 2016).	Advocacy and lobbying with regulators to overcome potential barriers to business model integration or outsourcing (Howells, 2006; Klerkx & Leeuwis, 2009; Kivimaa, 2014).

Figure 3: Business Model components

And in this second table, the Analysis of "Energiesprong" Business model:

	Facilitating – network formation and collaboration	Configuring – business model design	Brokering - advocacy and resource raising
Value proposition	Bringing together the necessary skillsets for energy performance contracts including expertise in offsite manufacture, asset and energy management, law and finance.	Designing performance contracts and developing the customer offer through collaborative design with the stakeholders in the network. Testing the customer offer through small scale trials and feedback with the end user.	In the Netherlands the intermediary secured regulatory changes surrounding energy service charges on social rents.
Supply chain	Co-ordinating actors within the supply chain to deliver net-zero energy retrofits through greater integration – facilitating learning and adoption of offsite manufacture techniques and modular solutions through collaborative procurement.	Managing procurement, tender process and contract terms with suppliers, as well as training and capacity building with SMEs in the retrofit supply chain.	Securing agreement from housing providers for large order volumes for net-zero energy homes – providing security for the supply chain to scale up operations.
Customer interface	Network formation and involvement of local community actors as well as public and private sector partners, holding regular events and outreach activities.	Developing marketing materials and customer outreach in collaboration with the housing provider or other representatives of residents. This included social media channels as well as more conventional forms of engagement, including focus groups.	Recruitment of housing association executives into the market development team to lobby for procurement of large numbers of net-zero energy retrofits within their host firms.
Financial model	Incorporating key financial stakeholders from both the private sector and government into the consortium from the earliest stages.	Mobilising financial resources and designing contracts, building on dedicated financial and legal expertise to develop the financial model.	In the Netherlands securing policy changes: for both efficiency subsidies and mortgage eligibility to be based on energy performance. UK and EU level: lobbying for innovation funding under EPRD; Interreg; and UK Industrial Strategy Challenge Fund.
Governance	A system building role – improving the links and between the elements of the business model towards an integrated mode of governance, ideally through a single solution provider.	Formalising the links within the supply chain and wider network. In the UK, case this involved the creation of a new business venture 'Melius Homes' which will act as an integrated solution provider.	Widespread PR and advocacy campaign across UK and EU to promote the Energiesprong business model with business leaders, local authorities and the Industry. With the aim of creating a network of 'advocates'.

Figure 4: Energiesprong Business Model Analysis

2.3 Advantages of serial renovation according to the Energiesprong principle

The Energiesprong principle is a win-win offer for owners (housing associations, in the long term also private homeowners), tenants and suppliers (general contractors and the supply industry). But it also offers advantages for other stakeholders and political actors from the international to the regional level:

- Energiesprong relies on a modular design, pre-assembly of the individual elements and a standardized process. This significantly reduces renovation time and construction costs.

- The refurbished buildings receive the particularly good energy efficiency standard, aiming for net-zero, in which just as much energy is produced throughout the year as is required for heat and household electricity. This makes the building future-proof and optimally prepared for future requirements.

- The aim is an implementation that is neutral in terms of heating costs, in which the refurbishment is financed from the resulting energy savings and lower maintenance costs - without any additional burden for the tenants.

- Tenant satisfaction increases because tenants receive a modern and comfortable home at fair prices and are only minimally disturbed during the conversion.

- As a rule, prefabricated facades have good recyclability. Because they are screwed to the house, not glued, so they can be removed more easily. In addition, the facade elements themselves can be taken apart and then, for example, repaired and reused. The sustainability of the materials also plays a major role in insulation.

2.4 Difficulties of retrofits

- Refurbishments are often too expensive and too slow.
- skills shortage.
- Lack of public acceptance.

2.5 Financing model

The aim is to achieve refurbishment costs that are largely refinanced from savings in energy costs and maintenance costs, supplemented by subsidies if necessary, so that the refurbishments can be implemented in a socially responsible manner. For the first projects, higher funding is essential for

good profitability, since construction companies initially incur high development costs that are passed on to the first projects.

With a larger sales market, however, the construction costs per square meter will fall in the future - due to higher quantities, a gradual standardization of the processes and an optimization of the planning and procedures. The Netherlands is a role model and a pioneer here: in just a few years, companies there have renovated 5,000 buildings with a construction volume of around half a billion euros according to the Energiesprong principle, reducing the costs by around 40 percent compared to the first projects.

2.6 The Cost

The renovation costs in the Netherlands is currently estimated at around 55,000 euros, but is to be reduced to 45,000 euros in the next few years. The target in the UK is €40,000 per Unit.

Ecoworks founder Emanuel Heisenberg puts the gross modernization costs for conventional refurbishments at €900 to €1,400/m² if the usual subsidies, such as the KfW, are included. For industrial refurbishment according to the Energiesprong principle, on the other hand, Heisenberg only expects €650 to €1,000/m² and, as the general contractor, also guarantees the client these final costs. We are reducing prices by 20 to 30%.

2.7 Comparison between „Atomized Market Model“ i.e. “traditional way” and „Energiesprong Business Model“

In the following table we can understand the main differences between Energiesprong and atomized business models.

	'Atomised' market model	'Energiesprong' energy performance contract
Value proposition	• Single measures • Emphasis on energy cost savings • Savings are estimated rather than guaranteed	• Multiple measures or whole-house approach • Emphasis on home improvement and comfort • Energy performance contract • Energy service guarantee of temperature (21°c), hot water volume (150L/day) and electricity (fixed kWh/year) • Energy supply contract subsumed in energy service agreement
Customer interface	• Largely left to the market to promote and engage customers, with responsibility for the marketing and engagement for the different components (i.e. measures, audit, finance) of the retrofit typically separated	• One point of contact for the promotion, marketing and sales of the full package necessary to achieve the retrofit, provided by the host company as a one-stop-shop • Emphasis on customer engagement through housing provider and face to face workshops
Supply chain	• Fragmented relationship with traditional separated trades (plumbers, carpenters etc.) installing the retrofit measures in sequence with limited co-ordination	• Highly integrated package of measures, using offsite manufacture techniques - provided in house or through trusted subcontractors • Supply chain may require legal and finance skillsets • Additional supply chain for electricity supply required, can be through fully licensed supplier model or through a white label scheme
Financial Model	• Finance is arranged via third party with little involvement in the retrofit process	• Lender developer / investor seeking to use energy performance contract structure to fund retrofits • Lender captures energy savings and charges back to property owner based on historic consumption • Retrofit supplier assumes responsibility for payment of energy bill

Figure 5: „Atomized Model“ vs „Energiesprong Model“

2.8 Transferability of European experiences to Germany

The European experiences within the framework of the Energiesprong initiative, especially those of the Netherlands – make it appear realistic that a new market segment for net-zero renovations with industrially prefabricated components can be permanently established. Ideally, several goals could be pursued at the same time: achieving the climate goals in the building sector, reducing renovation costs (or at least curbing the increase in costs) and giving the construction sector a boost in innovation. However, the requirements are different in each country. Aspects such as

- Structure of the building stock
- Addressable market volume
- Structure and innovative ability of the building fabric
- Availability of / experience with the required technology / expertise
- Regulatory framework
- Availability of funding programs in the construction phase

The following analysis of the transferability and feasibility of serial renovation in Germany begins with an inventory, with a particular focus on the activities of Energiesprong Germany and the status quo of the first pilot projects. Then, based on the aspects outlined above, the prerequisites in Germany for a broad market launch of serial renovation are analyzed and evaluated. This is supplemented by potential analyzes of serial renovation in Germany. Finally, the findings are summarized, recommendations for action are formulated and further research needs are identified. In 2017, the German Energy Agency (dena), with the support of the Federal Ministry of Economics and Technology, launched the Energiesprong Germany initiative with the aim of developing serial renovation solutions for apartment buildings in the German market and initiating initial pilot implementations. By bundling demand and thus implementing large projects, the construction industry should be encouraged to set up industrial manufacturing processes that should make a significant contribution to reducing renovation costs. The development of new business models with a performance guarantee is also supported by dena's market development team. After more than two years of work and numerous discussions and events with representatives of the housing and construction industry, Energiesprong Germany was able to convince 22 housing companies to sign a volume deal in November 2019 over 17,000 apartments are to be renovated serially over the next four years. This opens up planning and business perspectives for existing and new players in the construction industry who are looking to invest in new manufacturing capacity or develop new ones.

3. Financing Energy Renovation in Buildings (financial schemes)

Often, available financial resources are not exploited to the full extent due to lack of capacity and trust on the side of potential beneficiaries. Private homeowners as well as public authorities often lack information on available funding options or the resources and knowledge to apply for financing schemes.

In the case of public buildings and small municipal authorities, there is hardly ever a central agency responsible for project development and tender procedures that has an overview of funding possibilities, requirements and eligibility criteria. Additionally, there is often a lack of trust in energy efficiency improvements and in the multiple other benefits of building renovations. A lack of standardized underwriting processes, certifications and technical knowledge results in high transaction and operation costs, meaning financial institutions are generally reluctant to lend to energy efficiency projects.
The Energy Efficiency Financial Institutions Group (EFFIG)2 founded the DEEP (De-risking Energy Efficiency Platform) portal in 2017 to provide in-depth analysis and detailed information on the performance of energy efficiency investments. Users of the database can upload and share their projects to improve data availability and transparency in energy efficiency investments, both in buildings and industry. By sharing knowledge and experience, a comprehensive assessment of the benefits and financial risks can be undertaken to de-risk investments.

3.1 Types of financial support schemes

- **Grants/subsidies** are the second largest form of public finance. Subsidy schemes can address financial gaps for homeowners or companies. Grants/subsidies usually trigger a high co-financing (50%).
  Exemple: “Habiter mieux” programme, France

- **Debt financing** covers loans – often at low interest rates – offered by public institutions to building owners, energy companies or businesses. Debt financing often comes at limited public cost compared to other financial schemes.
  Example: KredEx renovation loans, Estonia

- **Tax incentives** are the financial schemes that boost the largest financial volumes in both private and public financing. Tax rebates and exemptions can remove financial barriers to energy efficiency investments and make energy saving technologies more beneficial.
  Example: Tax reduction scheme on renovation works, Belgium

- **Guarantees** are responsibilities by public institutions to help with repayments in case of unforeseen circumstances. A guarantee reduces the risk for the receiver and allows them to attract funds with more favorable conditions (e.g. risk sharing facilities).
  Example: Energy Efficiency and Renewable Sources Fund, Bulgaria

- Multiple schemes combine types of financial support into integrated financial solutions. Often subsidies are combined with a loan to reduce high upfront costs for the project owners or debt financing schemes come with a guarantee to reduce risks.
  Example: KfW Support Schemes, Germany.

3.2 Successful design and implementation of financial schemes

1. Political support and favorable legal framework

Government support can help secure EU funding and set up national and regional support measures. In Estonia, initial funding from the Ministry of Economic Affairs was crucial to establish a national loan program. The commitment of the government to set up a national agency (KREDEX) that deals with the development and management of financial schemes helped ensure a broad usage of public funding. Successful financing schemes should be embedded in a legal framework that supports their implementation. For example, in the case of multi-family buildings with mixed ownership, the scheme design and financial legislation should allow for homeowner associations to be easily registered and to obtain common loans or receive grants. Successful examples are the Estonian renovation loan program and the EU-funded Ukrainian Energy Efficiency Fund, which aims to establish 2000 new homeowner associations. Legislation should also allow for a combination of grants and loans to realize more energy renovations with high upfront costs that need high capital investment.

2. Simple procedures and practical support measures

National and, especially, regional and local officers often lack awareness about effective energy efficiency financing options. Easily accessible advice and technical assistance facilities can help to overcome this missing knowledge. Practical support, the development of bankable projects, user guidance and training, as well as support with tender procedures and complex application processes, should be integrated in the design of funding programs. Existing programs, mostly targeting private homeowners, include “one stop shops”, which provide comprehensive information and services on all aspects of energy renovations in one place. Also, user friendly online application systems and forms can simplify the accessibility of grants or other instruments.

3. Ability to attract private funding

As mentioned above, the sheer size of the necessary investment in the building sector requires additional private resources. Successful schemes should leverage a high ratio of private financial resources by including de-risking facilities (e.g. the P4EE Risk Sharing Facility) or state guarantees.

4. Contribution to long-term climate targets

Schemes financing energy efficiency measures in buildings are supposed to contribute to the long-term goal of a climate-neutral building stock. It is therefore helpful for public officers to set clear targets in funding schemes. A specific amount of energy saved, or CO_2 emissions reduced could be part of eligibility criteria for public funding schemes.

5. Long-term viability

A scheme's long-term viability creates stability and certainty for project developers, investors and other actors. Meaningful evaluation of the effectiveness of a scheme can usually be carried out only after several years of existence. It may take time for beneficiaries to become aware of the schemes and to prepare successful projects. Especially in the design phase of the national LTRS, public officers need to plan ahead and to make sure funding schemes run over the entire period covered by the strategy.
While longevity is an important feature, it might also risk slowing down the mobilization of further investment. Where support is perceived as given, it reduces the need for innovation and may not attract new project developers. Therefore, a regular revision or update is useful. Examples of long-term directed schemes are the UK's climate change agreements and climate change levy schemes, which have existed since 1999 and are currently running until 2023; and the Polish thermo-renovation and repair fund.

6. Flexibility

Another important factor is the flexibility to adapt to new circumstances, like a change in demand or changing political conditions. A successful example is the Program of Energy Renovation of Family Homes in Croatia which has been adapting its definition of eligible building types regularly to increase the number of beneficiaries. At the same time the required documentation and registration process to apply for the program has been simplified.

3.3 Step-by-step guidance for designing a financing scheme

The following steps are meant as recommendations on how to set up a financing scheme to ensure its effectiveness. While not comprehensive, they offer a minimum checklist to guide policymakers through the process:

Step 1 **Carry out a pre-assessment**

- Develop a detailed pre-assessment to categorise the status quo and the market according to end users and gain clear understanding of the specificities of particular market segments, in particular on possible barriers.
  - What is the exact purpose of the instrument?
  - Who are the beneficiaries?
  - What are possible renovation benefits?
  - Building stock analysis
  - Existing legal framework

Step 2 **Map available resources**

- Create an overview of available financial resources including an investigation of the investment/borrowing capacities of the local government, the residential sector, and the commercial sector.
  - What are budget lines for energy efficiency?
  - Budget transfers for energy efficiency purposes?
  - Borrowing capacity and willingness
  - Available financing sources
  - Household disposable income
  - Household energy expenses

Step 3 **Get inspiration from EU Member States**

- Research active schemes operating in other Member States and learn from good practices. One relevant source of information is the new Database of Energy Efficiency Financing Schemes (DEEP).

Step 4 **Design the scheme framework**

- Design the scheme. Set up a target and define specific target group(s). Explain and time the target to be achieved.
  - Which building segment to renovate and how many buildings?
  - How deep should the renovation be?
  - What resources will be needed (expected financing from the local government and building owner)?

Step 5 **Identify triggerpoints**

- Identify the trigger points when investment in energy saving measures can most easily be made. Frequently, combining energy efficiency measures with other building works will reduce costs and disruption.

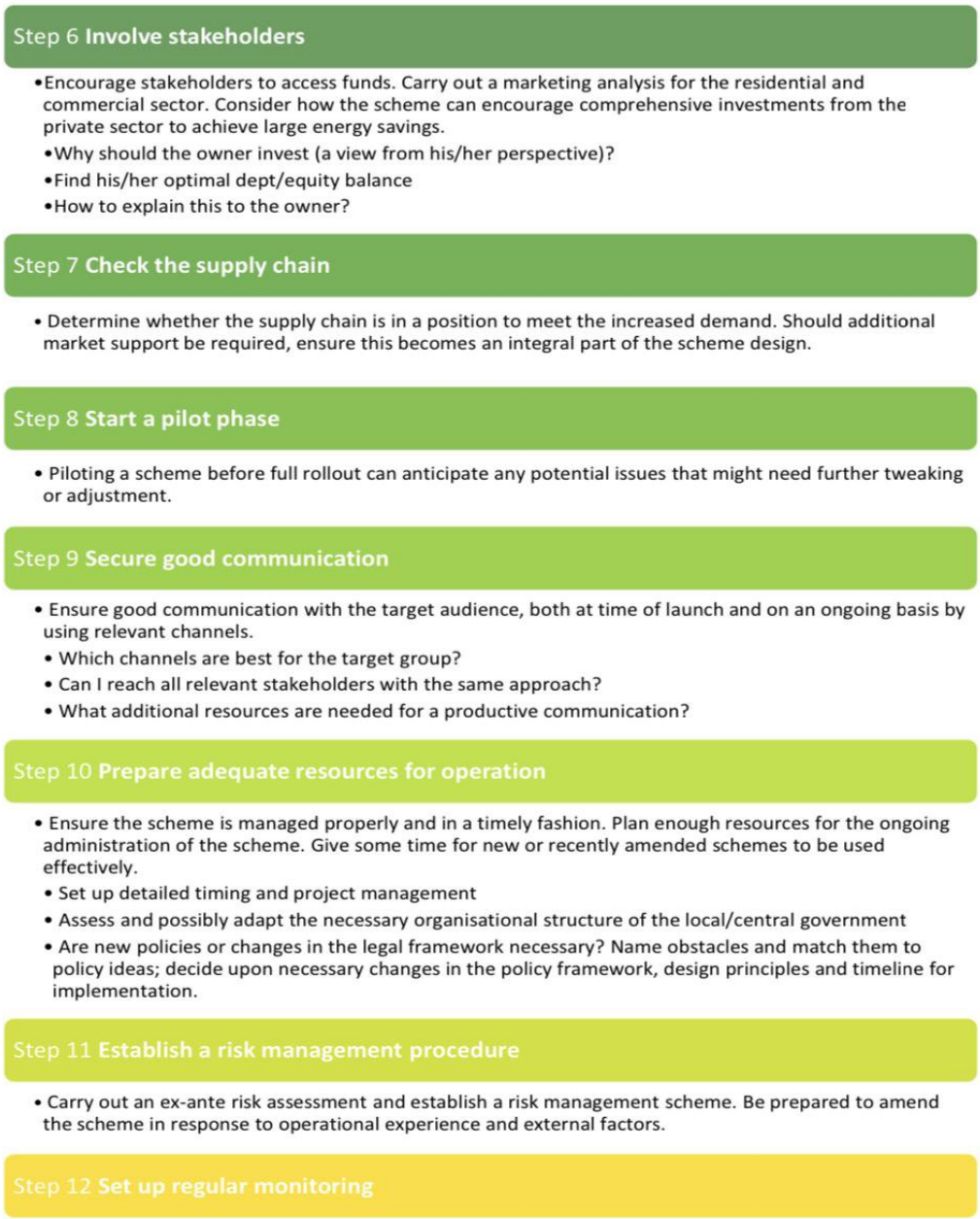


Figure 6: Step-by-step guidance for designing a financing scheme

4. ONE STOP SHOP APPROACH

One stop shops aim at providing integrated renovation services for existing buildings. Interest in the concept increased after the recast of the EU EPBD, which calls for improved advisory tools for consumers. Initially, huge potential was identified in the existing residential building stock. Interest took off in the Nordic countries, in which more than 40% of the building stock consists of single-family houses.

Often, a homeowner needs to contact several different contractors to get an energy renovation completed, which also increases the risk of mistakes. To fill the void between the supply and demand side, innovative user-oriented services began to emerge in Europe to unburden the customer by providing them with an integrated renovation service. The advantages of one stop shops include offering a turnkey solution to clients, better communication and knowledge sharing and the potential to minimize the risk of errors in the process.
One stop shop systems across Europe include:

➢ Pass Picardie, France https://www.youtube.com/channel/UCMijOtgd69mAFr9zZEEr-wg

➢ Oktave, France https://www.oktave.fr/

➢ Rhodoshop, Bulgaria https://rhodoshop.eu/en/results/

➢ SuperHomes, Ireland https://electricirelandsuperhomes.ie/

➢ BetterHome, Denmark https://www.renovate-europe.eu/reday/reday-2019/online-resources/betterhome-denmark-p12/

Innovative financial instruments

1- Green Bonds

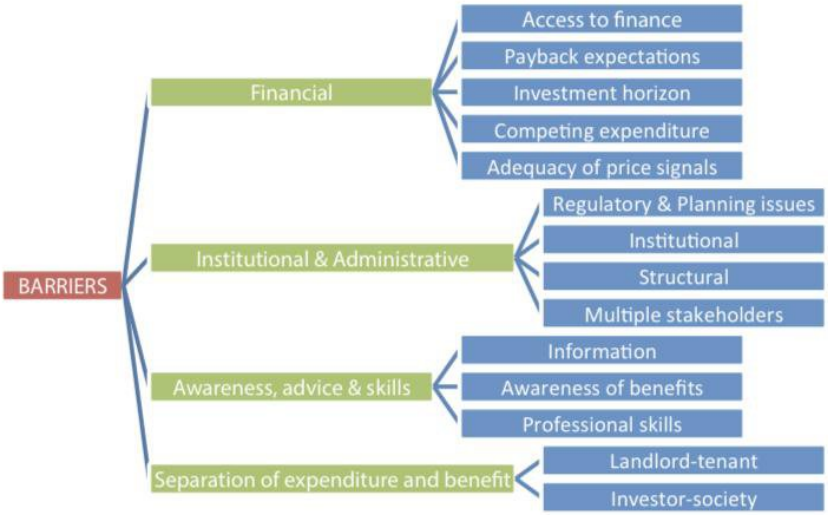
2- On-bill schemes

3- Revolving funds

4- Green mortgages

5. Barriers and Challenges

There are many Difficulties, Challenges and Barriers for Building Renovation. In this chart we can find a lot of them.



Figur 7: Barriers encountered in Building Renovation

Since we have barriers and difficulties, we have to develop a holistic policy response to them. In this Chart we can find the answer.

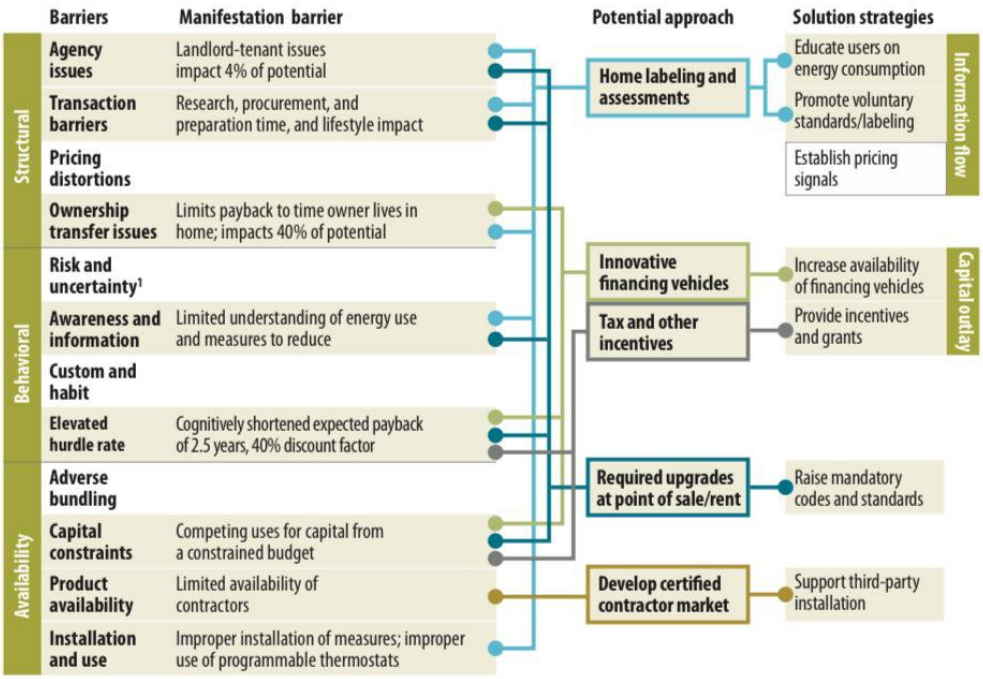


Figure 8: how to develop a holistic policy response to barriers

6. Developing a renovation strategy

Here, we consider the key steps in the development of a renovation strategy. They have been divided into 5 phases:

1. Identifying Key Stakeholders & Information Sources
2. Technical & Economic Appraisal
3. Policy Appraisal
4. Drafting & Consulting on the Renovation Strategy
5. Publication & Delivery Figure 10 illustrates the main phases including the key steps within each phase.

Figure 9: Simplified process flow chart for strategy development

The list illustrates the wide range of actions that should be given serious consideration to facilitate a successful delivery of the renovation potential.

STRATEGIC	Establish support across the political spectrum for deep renovation of the building stock
	Establish an independent committee to monitor and report progress on the strategy on an ongoing basis, including making recommendations for improvements and periodic updates
	Undertake systematic appraisal of barriers to renovation in each segment of the market and develop policy responses to address each barrier
	Establish objective to eradicate fuel poverty through energy performance improvements to the housing stock
	Develop holistic cross-policy targets that integrate with and deliver on goals in related fields, e.g. sustainable urbanisation, resource efficiency, sustainable construction etc.
	Establish a wide stakeholder group as a forum for consultation, policy formulation and feedback on practical issues and barriers to renovation
	Demonstrate leadership through accelerated deep renovation of public buildings, thereby developing supply chain capacity and providing a knowledge base for private/commercial renovation activity
LEGISLATIVE & REGULATORY	Identify trigger points and develop respective regulation that could be used to encourage, or require, building energy performance improvement[41]
	Design Energy Efficiency Obligations that encourage the delivery of deep renovation
	Facilitate the upgrade of all social housing to high energy performance levels
	Address restrictive practices concerning local deployment of low/zero carbon technologies to ensure that a positive environment for buildings integrated renewables is established
	Remove or implement measures to overcome restrictive tenancy laws which disincentivise or otherwise inhibit energy performance improvement
	Mandate improvement of least efficient stock to higher energy performance level, e.g. through restrictions on sale or rental of buildings in lowest energy performance categories
TECHNICAL	Develop renovation standards that are progressively and regularly strengthened in response to experience and new technological solutions
	Analyse potential for district heating systems to provide efficient, low carbon energy
	Ensure proper monitoring and enforcement of compliance with building codes
	Develop packaged solutions that can be readily replicated in similar building types
	Introduce quality standards/certification systems for installers & products (including packaged solutions)
FISCAL/FINANCIAL	Secure sources of finance, including those identified in EED Article 20 and EU/international funding sources, and develop mechanisms that effectively leverage private capital
	Factor in monetary value of co-benefits (e.g. health, employment) in public funding decisions
	Develop funding vehicles, tailored to specific market segments, that provide a simple ("one-stop-shop") and commercially attractive source of finance for deep renovation
	Develop mechanisms to encourage deep renovation via third party financing, e.g. ESCOs, EPCs
	Strengthen energy/carbon pricing mechanisms to provide the right economic signals
	Remove fossil fuel subsidies to eliminate perverse incentives that discourage investment
	Consider "bonus-malus" mechanisms, e.g. property taxation systems (which reward high energy performing buildings while penalizing poorly performing ones) and energy pricing
COMMUNICATION / CAPACITY BUILDING	Establish publicly accessible databases demonstrating energy performance of renovated buildings and information on how to undertake deep renovation
	Gear up skills and training programmes covering the key professions and disciplines
	Establish knowledge and experience-sharing networks across regions/Member States
	Encourage development of local supply chain industry for maximising macro-economic benefits and to minimise embedded CO_2 emissions
	Develop promotional and dissemination activities that sensitise building owners to opportunities for deep renovation and that provide stepwise support throughout the renovation process
	Communicate regularly and publicly on progress with the renovation strategy
R&D	Support research, development and demonstration projects into new & improved technologies and techniques to deliver deep renovation, including how to scale up best practice to multiple buildings

Figure 10: Checklist of actions to underpin the renovation strategy

7. Tenants Engagement

Tenants are very important for the renovation Process so it's better to have to get them involved. So there are some of the lessons learned from this process by the department of Tenants communication at ecoworks Company.

1- It's very important for the tenants to know enough information about the renovation and the new normal.

2- Seeing or visiting a model Home is also very useful.

3- If tenants don't understand how to operate the new installations and what they should do then all our work is useless.

4- Behavioral sciences can help us and the tenants to develop strategies to save more energy.

5- How long does the retrofit take? is one of the most important questions for the tenants.

6- We have to hear from the tenants before, during and after the renovation.

8. Quantitative data on residential buildings

In Europe more than 50% of the residential buildings were built before 1970 and have poor insulation. approximately 60% of the Germans live in rented accommodation and thus support the energy costs. Therefore, the owners of these accommodations see no "economic" need to invest. The implementation of measures is often blocked by a lack of financing options or an over-long return on investment. Low price expectations prolong this period until the differential investments in efficiency technologies pay for themselves in comparison with the baseline technologies.

The uncertainty about future developments is also a hindrance to implementing energy efficiency measures. Volatile energy prices and the accompanying expectations may have a major influence on the deployment of energy efficiency measures.

the following two main barriers are still existing:

- Lack of clear information on the incentives proposed by the different regions
- Lack of guidance in how to choose the right professionals

The end-consumers are still lacking knowledge on:

- The economic potential of energy savings,
- Potential improvements to their processes and procedures,
- The many options and products available to exploit this potential

The market is still subjected to several factors: the case of the Netherlands

- Low priority of energy issues for consumers due to financial constraints
- Information regarding opportunity costs is not clear (e.g. towards consumers: what price do you pay now, and what will it be worth in the future)
- Insufficient participation of actors regarding energy-efficient renovation
- Financial restrictions for consumers, as many of them are not able or willing to invest in energy renovation
- A focus on large players means small companies get less of an opportunity to operate alone, they are losing profit to the energy providers.

presents a general comparison on the domestic renovation situation of each county included in the analysis.

Quantitative data	Belgium	France	Germany	Netherlands	UK
Total number of residential buildings in million	4.5	25	40	7	25.5
Percentage of residential buildings built before 1970	65.5%	47.6%	74.3%	47.8%	55%
Expenses on home improvement in € billion (2013)	2.4	12.8	21.6	3.2	12.8
Average expenses €/household	0.53	0.51	0.54	0.46	0.50

Figure 11: quantitative data on residential buildings and expenses

Categories	Criteria	Belgium	France	Germany	Netherlands	UK
Government	Does the government has strong focus on this topic?	Mitigate	Yes	Yes	Yes	Yes
	Does the government has a clear long term strategy (targets and time scale)?	No	Yes	Yes	Mitigate	Mitigate
	Does the government propose tax incentives, funds etc. for energy efficient domestic renovation?	Mitigate	Yes	Yes	Mitigate	Yes
Companies	Do energy providers promote domestic renovation?	Mitigate	Mitigate	No	Mitigate	Mitigate
	Do the professionals have a strong expertise in auditing the energy performance of the buildings and in providing a complete renovation solution?	Mitigate	Mitigate	Mitigate	Mitigate	Mitigate
	Do small companies play a major role in the insulation (grounds, roofs, walls, windows insulation) and in the heating systems installation and maintenance markets ?	Yes	Yes	Yes	Yes	Yes
	Do large companies play a major role in the insulation market?	No	No	No	No	No
	Do large companies play a major role in the heating systems installation and maintenance market?	Yes	Yes	No	Mitigate	Yes
Customers	Are there a lot of potential customers?	Yes	Mitigate	Yes	Mitigate	Mitigate
	Is there a significant amount of people investing in domestic renovation works?	Mitigate	Mitigate	Mitigate	Mitigate	Mitigate
Customer Journey	Do people have an easy access to information about government helps (subsidies, tax incentives...)?	No	No	No	Mitigate	No
	Is there easy access to information from professionals about audit and advices?	No	No	Mitigate	No	No

Yes Mitigate No

Figure 12: quantitative overview of domestic renovation