# ENERGY RETROFITTING OF SOCIAL HOUSING THROUGH ENERGY PERFORMANCE CONTRACTS

## A feedback from the FRESH project: France, Italy, United Kingdom and Bulgaria

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**Authors:**

Christophe MILIN

International Conseil Energie (ICE)

27 rue de Vanves

F-92100 BOULOGNE-BILLANCOURT

cmilin@iceconsultants.com

Adrien BULLIER

Immobilière des Chemins de Fer (ICF)

24 rue de Paradis

F-75010 PARIS

adrien.bullier@groupeicf.fr

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# ABSTRACT

Lack of adapted funding is a major barrier to the energy retrofitting of social housing in Europe. Funding could be found through the Energy Performance Contracts (EPC), in which an Energy Service Company (ESCO) invests in a comprehensive refurbishment (building insulation and renovation of the heating systems), and repays itself through the generated savings.

In the IEE supported FRESH project, social housing operators and ESCO from France, United Kingdom, Italy and Bulgaria propose to work out the legal, financial and technical framework for EPC's in social housing. The main results will be the tested implementation of EPC for comprehensive refurbishment at four pilot sites, as well as concrete tools and recommendations to public authorities for possible replication at national and European level.

The present document explains how EPC's could help structure an economic model contributing to reduce greenhouse gases emissions in social housing by a factor 4 in 2050, by securing energy savings and attracting private capital. We present the state of advancement of the pilot projects in France, Italy and the UK, as well as the situation in Bulgaria. We then analyse the major obstacles to replicate EPC's in social housing at a larger scale, and propose legal evolutions as well as public policies in that aim.


# 1 APPROACH AND OBJECTIVES

## 1.1 CURRENT TRENDS IN THE HOUSING SECTOR

Buildings account for 40 % of Europe's energy use and a third of its greenhouse gas emissions. Given the context of rising energy prices, fuel poverty affecting millions of households across Europe and the need to mitigate climate change, it is crucial to massively refurbish the existing housing stock at low energy consumption standard. Since 1997, the "Factor 4"[1] has been officially included as a target in several national policies (e.g. France, UK, etc.) to refer to a 75% reduction in greenhouse gases emissions by 2050 compared to 1990. Recent works show however that, even in countries with low carbon content electricity and large biomass potential like France, a factor 4 target on greenhouse gases emissions cannot be reached in the residential sector without beforehand dividing useful energy needs by at least a factor 2[2].

With an overall stock of 206.7 million homes in the EU-27, approximately 2.3 million new homes being built per year[3], and 0.15% of the stock being destroyed per year[4], current dynamics in the residential sector lead to the conclusion that nearly 70% of the building stock in 2050 is already built in 2005. In addition, if we consider that only 0.3% of the stock is subject to an energy refurbishment per year[5], we

[1] The concept originally refers to improving by a "factor 4" the productivity of resources (FACTOR 4 1997).

[2] IDDRI 2010

[3] FEDERCASA 2006

[4] ICE based on UNECE 2001

[5] ICE based on DG-TREN 2007

can conclude that, on average, most of this stock (over 90%) will stand as it is in 2005, without having been energetically refurbished (see Figure 1).

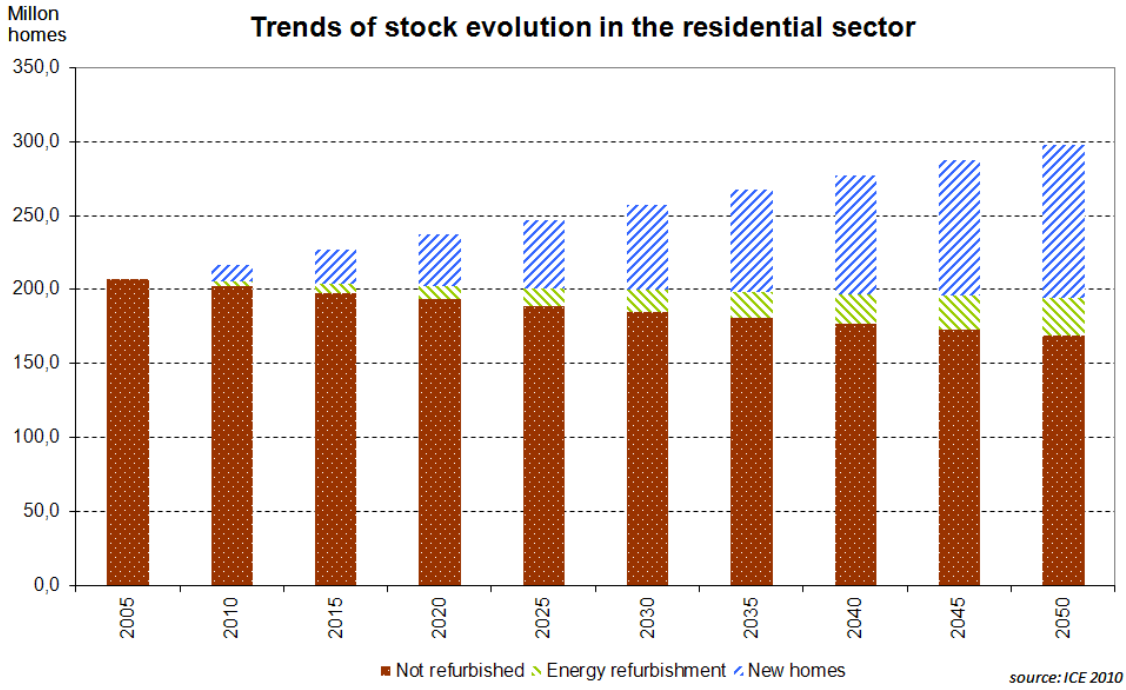


**Figure 1: Trends of stock evolution in the residential sector.**

That means that even if we take the strong hypothesis that all new homes are built at 0 kWhpe/m² (meaning they produce all the energy they consume) and all refurbishments are very ambitious and lead to low energy consumption of 80 kWhpe/m², considering an initial average consumption for the actual stock of 250 kWhpe/m², the overall stock in 2050 would still consume on average 149 kWhpe/m² (see Figure 2). Considering the inertia of the residential sector, a factor 2 or factor 4 on its average energy consumption will hardly be met without accelerating sharply (at least multiply by 10) the rhythm of refurbishment at low energy consumption standards.

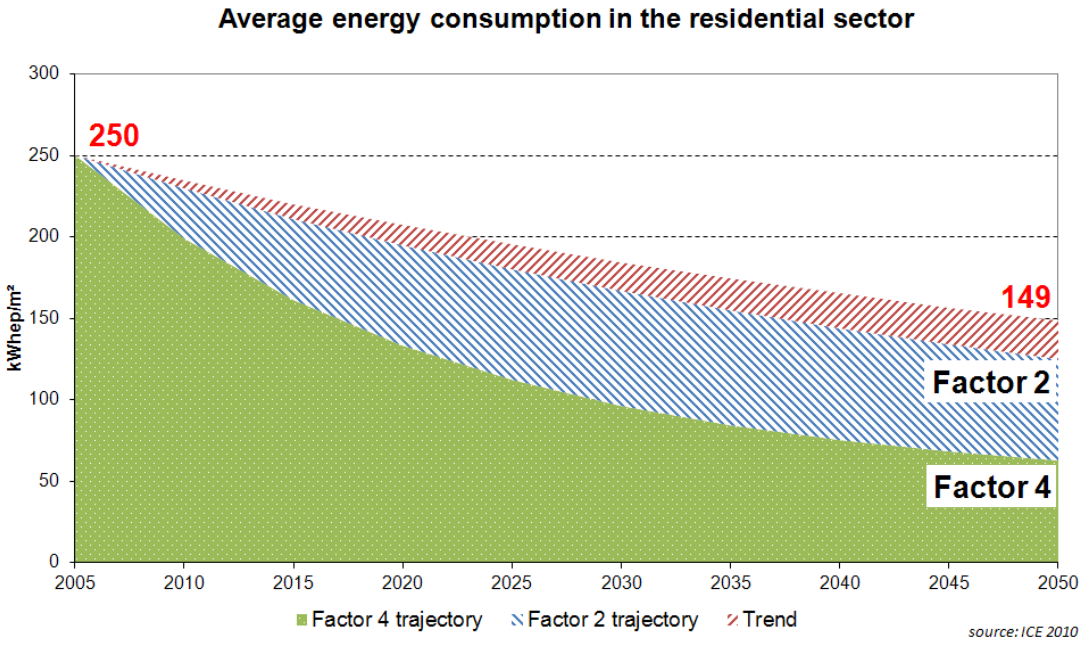


**Figure 2 Evolution of average en energy consumption in the residential sector.**

Under those strong hypotheses, 70 to 180 Million of homes need to be refurbished at low energy consumption standards before 2050 in order to reach the Factor 4. If we consider an average cost of 23,000 Euros per comprehensive refurbishment[6], this means that approximately 1,500 up to 4,000 billion Euros need to be invested in energy refurbishment of the residential sector before 2050, a rough average of 40 up to 100 billion Euros per year for 40 years at European level. This is equivalent to dedicating half the amount of the European Economic Recovery Plan (200 billion Euros announced) to the sole residential sector refurbishment every year for 40 years.

## 1.2 LACK OF ADAPTED FINANCING MECHANISMS

### Energy savings are the only available resource

Though current market trends do not enable to reach the collective target of Factor 4, it is hardly possible to imagine that the required amount of investment could be mobilised each year at European level with traditional public incentive mechanisms (such as subsidies, tax rebates or subsidised loans). Indeed, public resources to support investment are scarce, not sustainable by nature and may not have sufficient gearing effect to address the issue of Factor 4 with the appropriate volume and rhythm. Besides, most of the existing incentive mechanisms in the residential sector benefit only to a limited range of the population (mostly solvent homeowners in individual dwellings) and constitute a partial answer to larger needs (solvency, guidance, technical assistance, etc.).

If we relate the amount of investments required to reach the Factor 4 in the residential sector with the European population, the average effort would be of 80 up to 200 Euros/inhabitant to be mobilised each year. For comparison, the average contribution per citizen to the EU budget was in 2010 of 280

[6] IDDRI 2010 estimates 13,000 to 25,000 Euros per dwelling in France only for building measures. If we add 2,000 to 6,000 Euros for HVAC, the average for comprehensive refurbishment would be 23,000 Euros.

Euros/inhabitant[7]. In France, the global investment made possible in 2010 by the subsidised loan scheme named “eco-PTZ” was of 1.3 billion Euros[8], that means an average of 20 Euros/inhabitant.

The only resource adequate with the amounts to be mobilised seems to be the energy bill. In France for example, an inhabitant spends on average 590 Euros for domestic energy[9]. Dividing this bill by 2 or 4 could generate the required long term resources to make energy refurbishment investments profitable.

## Energy performance contracting (EPC): structuring the economic model

Energy retrofitting differs from other investments because it does not produce a direct income but rather an avoided cost. Energy savings are usually not considered like a tangible income by financial institutions, due to the legal framework (see below), and to the uncertainty of actual savings, which may sometimes not be achieved due to a bad design, implementation and operation of the building’s HVAC system.

An energy performance contract[10] is a contractual arrangement in which an energy service company (ESCO) designs and implements an energy retrofit with a guaranteed level of energy savings. The energy savings are used to reimburse the ESCO’s initial investments (although EPC can also be financed directly by the owner). The owner or the tenant may benefit from a part of energy savings. After all investments have been reimbursed, the contract ends and the owner and/or the tenant benefits from all energy savings.

We focus here on EPC’s involving not only services (“Chauffage” or “Anlagen-Contracting”), but rather investments on heating systems and the building envelope. It should be noted that, considering the current low energy prices and still large investment costs related to comprehensive refurbishment, energy savings are usually not large enough to repay the investments within a reasonable contractual duration: in most cases, the building owner has to pay an additional fee to the ESCO. This additional fee is also justified by the value added to the property, both because of its energy performance (“green value”) and because the building is refurbished and more attractive.

[7] ICE based on EC 2010

[8] ADEME 2010

[9] INSEE 2008. Data for 2006, of which 71% heating, 13% light and appliances, 10% hot water and 6% cooking.

[10] EPC’s have been implemented in the industry for many years, and to a lesser extent in buildings. The following definition is adapted to the specific perspective of comprehensive energy retrofitting of buildings. More complete descriptions of EPC’s can be found in JRC 2007 and EUROCONTRACT 2008.

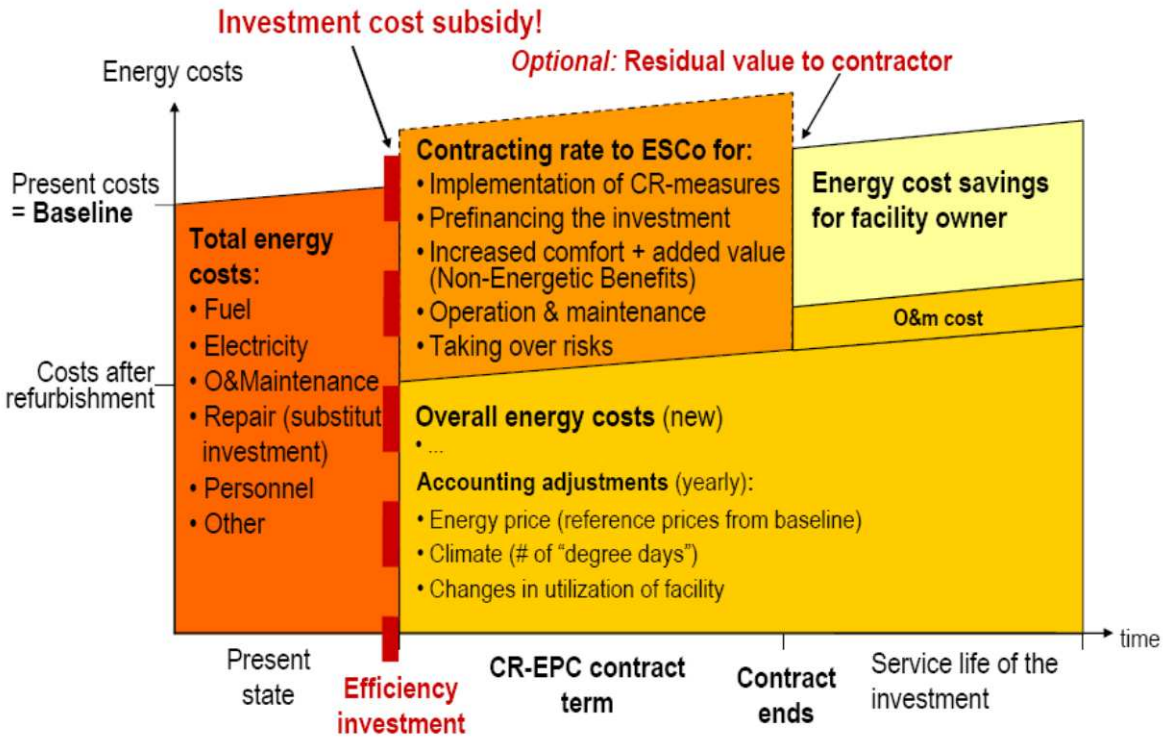


**Figure 3: Energy Performance Contract for comprehensive energy retrofitting requires an additional fee from the owner as energy savings are not sufficient[11].**

In an EPC, the achievement of actual energy savings is the condition for the ESCO to be paid. EPC's constitute a possibility to turn intangible energy savings into a secured (guaranteed) cash-flow (an energy efficiency service) that can serve as a basis to structure a business model based on energy savings and develop the mechanisms to finance Factor 4 in the residential sector.

## Performance guarantee: a key to secure investments

EPC's quantify and guarantee long-term energy savings. This guarantee ensures that the cash flow generated by energy savings will be stable and can repay the related debt. The EPC protects the investor against payment defaults or additional costs to cover the unachieved energy savings.

As of today, energy savings in the building sector are not considered a secure source of income by the banking and financial sector in general. Banks require traditional guarantees to cover all the debt, which will quickly limit the amount of investments a building owner can make, and prevent any strategy to reach Factor 4. With a performance guarantee, investments in energy efficiency may be required a lower risk premium as income is guaranteed for the time of the contract, thus lowering financial costs. Energy saving measures can therefore become more attractive to the financial sector, opening the way for massive investments.

## Third-party financing: attracting private capital

In an EPC, investments can be financed either by the building owner, by an Energy Service Company (ESCO)[12] or by a financial institution. The scheme we are targeting involves the externalization of the

[11] EUROCONTRACT 2008

[12] According to JRC 2007, an ESCO is a natural or legal person that delivers energy services and/or other energy efficiency

debt related to energy conservation measures: investments are financed by the ESCO, either directly or (more generally) through different financial products.

The following results can be expected from a large-scale implementation of such EPC's:

- Energy savings guarantee a positive cash-flow, so that they can become a counterpart to investments in energy efficiency and secure debt repayment.
- Building owners do not need to invest directly on energy efficiency: debt linked to energy retrofitting does not appear on their balance sheet, which maintains their capacity to invest.
- Building owners can thus allocate their equity and debt to other investments, mainly their core business, but also other energy efficiency investments which would not be made through EPC's. Indeed it cannot be expected that all investments can be made through EPC's
- They open the way for private capitals to be invested in energy savings, providing an alternative to the insufficiency of available public funds.

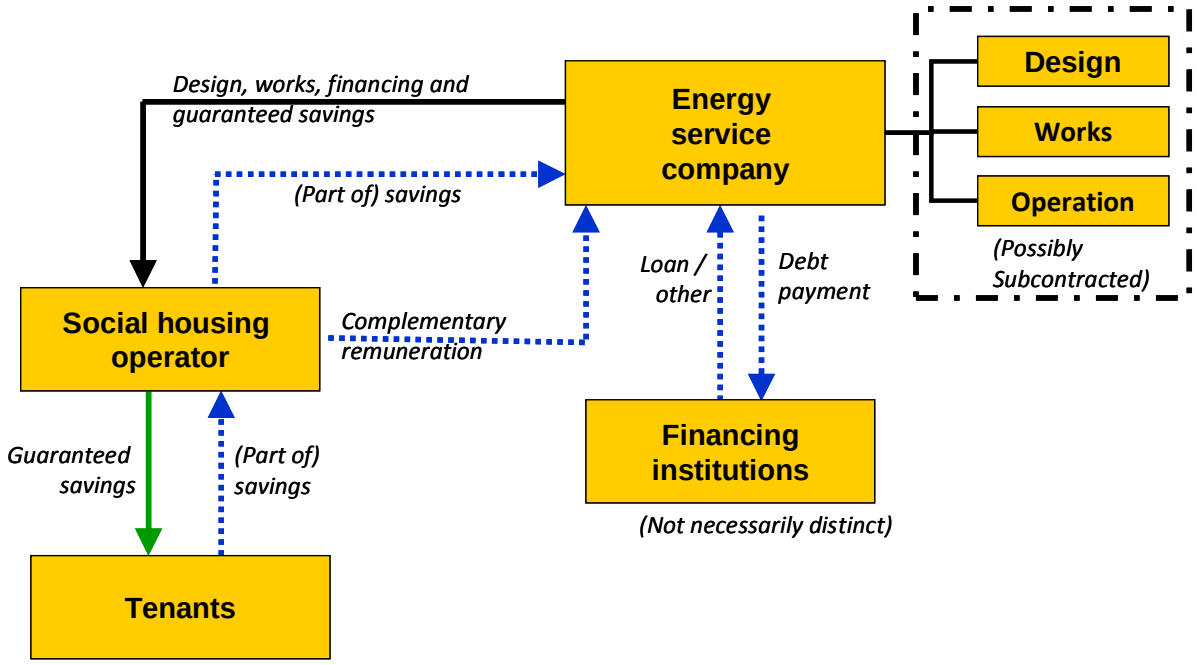


**Figure 4: Organization of an Energy Performance Contract**

## 1.3 COMPREHENSIVE ENERGY RETROFITTING

Energy savings measures can be achieved in housing through investment in improved energy management, regulation systems, heating and domestic hot water equipments, switching to renewable energy sources, and investment on the envelope insulation (windows, ceilings, ground floors, and facades). These investments have different cost levels and impacts in terms of energy savings, which are represented in Figure 5.

improvement measures in a user's facility or premises, and accepts some degree of financial risk in so doing. The payment for the services delivered is based (either wholly or in part) on the achievement of energy efficiency improvements and on the meeting of the other agreed performance criteria.

It should be noted that at the European level, this type of analysis is very general and has mostly a heuristic value. In particular:

- costs depend largely on national and local labour costs;
- energy savings depend largely on climate and on the initial level of energy performance;
- payback period depends largely on local energy costs (and also on energy inflation, though it is usually not taken into account by financial experts due to its unpredictability).

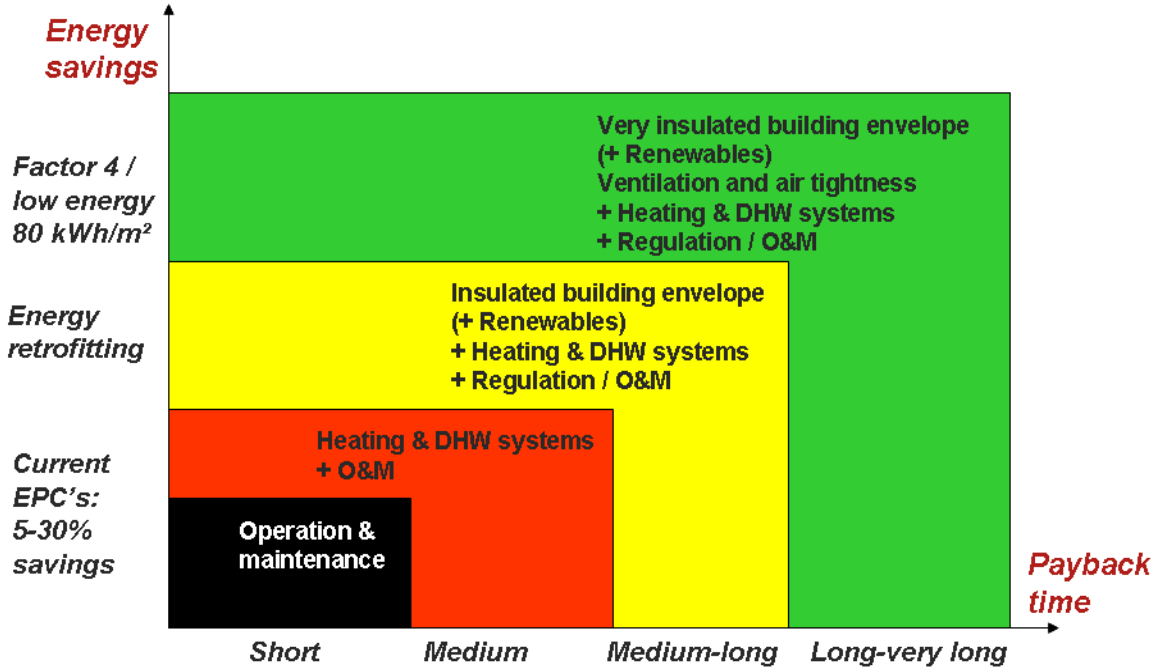


**Figure 5: Factor 4, long-term investments and EPC's**

The natural tendency of building owners and investors is to focus on the more profitable investments, which is in contradiction with the general interest of climate change mitigation.

Currently, EPC are generally limited to the simplest operations, well known by operators, with relatively short payback period (< 10 years). In particular, the majority of the EPC signed to date focus on the refurbishment of energy production/distribution systems (e.g.: replacement of boiler, insulation of the distribution systems,…), without intervention in reducing the useful energy demand (e.g.: insulation of the frontages, replacement of the door frames,…). A large energy saving potential is therefore lost at least for a generation before the next refurbishment program is undertaken.

Furthermore, considering the average lifetime for energy production systems, refurbishment will not arise more than 2 times during the 40 years period between now and 2050. Therefore, the current situation is likely to pose a serious problem in the medium to long term for building owners who have signed such minimal EPC since they may have no more possibility to contract on a package of operations, combining investments with short payback period (HVAC systems) that compensate for the longer payback period of other investments (building envelope), in a way that ensures a global profitability for the operation, acceptable from an investor point of view.

In a nutshell, if implemented in accordance with current market practices, EPC may focus only on the "low hanging fruits" and once those have been picked, building owners may never be able to finance

the required interventions on the building envelope, which represent very high costs with very long payback periods, and may lose the possibility to reach a factor 4 on their greenhouse gases emissions at an acceptable cost.

It is therefore necessary to show market actors that it is possible to implement EPC's for comprehensive energy retrofitting, including investments on the building envelope. It may also be necessary for public authorities to structure the EPC offer, in order to create the schemes capable to serve the collective target of Factor 4 (see recommendations).

## 1.4 THE SOCIAL HOUSING SECTOR

Social housing has developed in various times and forms across Europe and is characterised by such diversity of national housing context, conceptions and policies that it is difficult to address "social housing in Europe" as a homogenous concept[13]. Social housing can be characterised though by some common elements that makes it possible to outline a common definition in which the sector:

- is assigned specific missions of general interest;
- intends to increase the offer of affordable housing by constructing, managing, purchasing and/or renting houses;
- addresses target groups (either in socio-economic terms, or in terms of vulnerability of various types).

Crossing all these features, social housing represents 35 million homes across Europe (17% of the overall stock), mostly built before 1975 and housing 120 million people[14]. For most of the rental social housing, they are managed by specific entities we refer to as "Social Housing Operators" (SHO's), which have different features from private housing due to their history and present activity.

Although it has been for a large part created by the corporate sector and civil society, social housing has become in most European countries one of the major instruments for public authorities in the enforcement of a housing policy. The link between social housing and public policies is embedded in the mission of social housing, thus creating interdependence between SHO's and public authorities.

### High potential for massive energy retrofitting

SHO's are one of the major players to mobilise in order to reduce energy consumptions and greenhouse gases emissions in the housing sector. They are the only institutional players specialised on housing management, a sector in which the level of professionalism is often low. SHO's have very similar features, and they manage an important housing stock compared to a private landlord. They have a much better decision-making capacity than condominiums, even though they may be limited by financial resources and local governance problems. They manage in the long term (30-50 years) the housing they build, which is an incentive to reduce future operational and maintenance costs. Their technical expertise, including in terms of energy performance, is also much better than private housing companies or individual landlords.

Through a limited number of SHO's, it is possible to reach quickly a very large number of dwellings. The replication potential for energy retrofitting is therefore quite high if the financial mechanisms are

[13] According to CECODHAS 2007

[14] TACKOBST, 2007

appropriate.

SHO's have several strong incentives to the energy retrofitting of their housing stock:

- Considering its general interest mission and its dependency on public funding, the sector is usually targeted as priority and assigned the strongest regulations in terms of energy performance;
- for SHO's, reducing tenants' energy bills is a way to secure their solvability, hence reducing the amount of unpaid rents and vacancy.
- as long-term managers of their housing stock, it is worth for SHO's to anticipate future regulations on existing buildings, in order to avoid forced retrofitting before complete amortization of previous investments, reduce the costs of future refurbishments and postpone the following refurbishments.
- the "green value" generated by the energy performance of buildings is progressively integrated in financial approaches, as a result of rising regulations and energy prices, all the more as SHO's have a long-term perspective.

## Massive financial needs

The previous analyses on the need to massively refurbish the residential sector also apply to social housing, though its average energy consumption per square meter is usually lower than standard housing. Applied to social housing, the hypotheses above result in 11 up to 27 Million of dwellings to retrofit at very low energy standards before 2050 in order to reach the Factor 4.

This means roughly 270 up to 670 billion Euros to be invested in the sector before 2050, an average of 11 up to 27 billion Euros every year for 40 years at European level. Factor 4 target and the associated number of dwellings to be refurbished at low energy standard exceed largely the direct investment capacity of even the wealthiest SHO's in the mid to long term, all the more since SHO's are also required by public authorities to invest in new affordable housing.

The main obstacles for social housing operators to reach Factor 4 are technical, organizational and financial. While technical and organizational problems are progressively being solved through technical innovations and training programs, there is no clear answer to the financial problems. Energy retrofitting in social housing is currently financed through equity, grants and public loans with low interest rates, none of which will be available in sufficient quantities to reach factor 4.

Moreover, specific barriers are slowing down the rhythm of energy retrofitting and lowering the energy saving targets:

- there is no return on investment when SHO's invest in energy efficiency measures and tenants profit from reduced energy bills ("split incentive" barrier);
- SHO's generally cannot, under the constraint commonly connected to their institutional mission, raise rents to balance their investments for energy savings, nor they can, in most cases, charge an additional service for energy efficiency, even if the overall bill after refurbishment is lower that before;
- the generalization of low energy refurbishment will be limited by the debt rates of SHO's, even in the case where investment could be balanced by higher incomes.

An Energy Performance Contract is a possibility for a SHO to externalise part of its debt and invest in

the long term value of its stock without impacting its balance sheet, hence preserving its financial resources for its other missions. Furthermore, the guarantee provided by the ESCO on the energy savings to be achieved is secured by contract, with possible penalties or compensations to be applied in case of failure, which should mitigate the risk related to this off-balance debt. The comparative analysis of refurbishment costs between a direct financing option and an EPC, which is logically more expensive, is therefore only partially relevant, as it excludes the two main advantages of the scheme which are:

- Capitalising (guaranteed) energy savings as a mean to secure investments,
- Mobilising private capitals as a substitute to the reduction of public investment capacities.

## 1.5 THE FRESH PROJECT

Although the market is well identified, EPC's are currently not used for refurbishing the social housing stock because there is no visibility on the business model. Today, EPC's usually target the optimization of energy systems such as boilers, heating and ventilation, and control systems, but rarely include measures targeting the building's envelope. A large energy saving potential is therefore lost at least for a generation before the next refurbishment program is undertaken.

The FRESH project[15] aims at experimenting Energy Performance Contract (including third-party financing) for the comprehensive refurbishment of social housing in France, UK, Italy and Bulgaria. FRESH partners identified pilot sites and are working out the legal, financial and technical framework for EPC's in social housing. The objective of the project is to pave the way and demonstrate to social housing operators that energy performance contract can be used for low energy refurbishment on a large scale. The expected results from the project are:

- Tested implementation of energy performance contracts for comprehensive refurbishments in the social housing sector in France, UK, Italy and Bulgaria,
- Handbooks for social housing operators and ESCO's to implement energy performance contracts in social housing,
- Recommendations to national and European authorities for the diffusion of EPC's in social housing,
- Continuous information of stakeholders and professional branches at national and European level in order to disseminate the project's results.

# 2 FIRST RESULTS FROM THE FRESH PROJECT

The French, Italian and UK contracts are currently under negotiation and we're therefore limited in the information and figures that can be provided. More information, notably implementation handbooks including template contracts, will be made available later at the project website.

[15] www.fresh-project.eu. FRESH is financed by the Intelligent Energy Europe programme. The sole responsibility for the content of this paper lies with the authors. It does not necessarily reflect the opinion of the FRESH partners or of the European Communities. FRESH partners and the European Commission are not responsible for any use that may be made of the information contained therein.

## 2.1 CASE STUDY IN ITALY

### Situation of the social housing sector

Rental social housing in Italy represents 1 million dwellings at the national level[16]. SHO's are public bodies usually owned by provinces. They manage a housing stock which is mostly owned by municipalities, who allocate the dwellings and define the investment policies. SHOs therefore have little decision power on the housing stock. Rents are based on the income of households and do not reflect the real cost of housing. Since the end of the Gescal fund in 1998, there is no structural financing scheme for social housing.

As a result, Italian social housing faces a structural deficit for SHO's, who have low investment capacities for maintenance and refurbishment of the housing stock; investments are partly financed through the sale of parts of the social housing stock. Apart from the scarce subsidies available for urban renewal projects, there is no specific funding for energy retrofitting.

### Specificities related to EPC

Italy has a specific regulation for energy performance contracting. In particular, the law stipulates that the duration of EPC is limited to 12 years, with a possible extension to 15 years. However, it is possible for SHO's to recover all energy savings if 100% of tenants give their agreement.

### On-going results from case study

As a result of the 12 years limit on the contract duration, the 12-dwelling Italian pilot site focuses on heating and hot water systems. The collective gas boiler will be changed; hot water supply will be switched from electric boilers to the collective boiler. The EPC may include ceiling and ground floor insulation. The target is a 35% reduction of energy savings.

ACER (SHO) requested official approval from the municipality (obtained in October 2010) and 100% of the tenants (not yet obtained some signatures missing) necessary condition to sign an EPC. Considering the competitive dialogue process in relationship to the Italian law and the amount of investment, the EPC signature should take place during the 1st semester 2011.

## 2.2 CASE STUDY IN FRANCE

### Situation of the social housing sector

In France, social housing is owned and managed by local public companies (2.1 million units), public-private companies (0.3 million), and private companies (1.9 million). It is traditionally financed through subsidies (although they are decreasing), low interest loans, and rents, with tenants receiving housing benefits based on their income level. Energy retrofitting is currently financed through specific low interest loans (1,9% for 15 years), and tax reductions representing up to 25% of investments. This generous funding policy may not last very long as it represents a high cost for the State bank Caisse des Dépôts. The planned budget for energy retrofitting loans (1.2 billion Euros) represents roughly 10% of the needs until 2020[17]. Energy savings certificates represent an additional source of income

[16] Co-operative social housing, which is owner-occupied, is not taken into account in the FRESH project.

[17] Retrofitting 800,000 dwellings consuming more than 230 kWh/m².a (energy classes E, F and G) to class C (150 kWh/m².a) at an average cost of 15,000 Euros represents 12 billion Euros.

for energy retrofitting.

### Specificities related to EPC

Rents are capped and cannot be raised after retrofitting, but energy savings can be partly recouped from tenants: SHO's can charge a flat amount representing 50% of energy savings for a 15 years period. This represents 30% of capital costs for a 25 years payback, which is an average.

EPC's with third-party financing can be implemented as private contracts only by private SHO's. Public SHO's need to use PPP contracts, which entail the loss of fiscal benefits. Financing through EPC is therefore limited to private SHO's, which represent 42% of the social housing stock.

### On-going results from case study

The French pilot site (64 dwellings) will implement a comprehensive refurbishment including the renovation of common parts and dwellings, and low energy refurbishment with most probably some investments on the building envelope. The contract is planned to last 20 years.

ICF (SHO) initiated the tender procedure requested by French law (and chose to go through a competitive dialogue procedure) to select the ESCO for their EPC. 3 ESCO's have been selected in June 2010 for the competitive dialogue. The ESCO's have conducted their technical studies at the pilot sites during summer and presented a 1st offer in November. After negotiation, the signature of the French EPC is expected during the 1st semester 2011.

## 2.3 CASE STUDY IN UNITED KINGDOM

### Situation of the social housing sector

In the UK, social housing is defined by its missions and the statute of SHO's. Social housing is rental housing for low-income households, with rents regulated by public authorities. Social housing is provided by local authorities and housing associations, which altogether manage around 3.9 million dwellings. It is financed through subsidies for construction. The rents represent an economic cost of housing, and 61% of tenants receive housing benefits based on their income. Housing associations also finance social housing through "market rent" accommodation and the sale of new built housing.

### Specificities related to EPC

Energy retrofitting does not benefit from tax discounts or low interest rates, but energy savings certificates delivered in the frame of the Carbon Emission Reduction target can finance up to 90% of investments. Rents cannot be raised above the legal ceilings in case of energy retrofitting, and energy savings cannot be recouped from tenants.

### On-going results from case study

The UK partners have chosen to focus for their pilot site on sheltered housing, i.e. a retirement home where the rent contract is a private contract between the SHO and the manager of the retirement home, which enables to recoup 100% of energy savings. The EPC focuses on the replacement of the old gas boiler by a biomass plant, generating up to 80% savings in CO2 emissions, although primary energy savings are estimated at 8% only. The contract is planned for 15 years.

Places for People (SHO) and Fontenergy (ESCO) are associated since project inception. Both partners are still negotiating the UK contract.

## 2.4 CASE STUDY IN BULGARIA

### Situation of the social housing sector

Social housing in Bulgaria is very different than France, Italy and the UK. During socialist times until 1989, like in most of other East European countries, new housing was built predominantly by the Government in a set of tight limits in size and quality. Unlike other socialist regimes, ownership was transferred immediately to residents. As a result, social housing in Bulgaria covers all the housing stock built by the State before 1989, which consists mostly of multi-family buildings managed by condominium associations. This covers 97% of the housing stock, which is in bad technical conditions and highly energy consuming.

The need for energy retrofitting is very important, and there are financing schemes available for retrofitting housing: special loans from the EBRD (European Bank for Reconstruction and Development) distributed by retail banks, State grants from the National Renovation Program. A major issue for housing policies is the difficulty for condominiums to reach collective agreements on investment decisions. So far, only very few condominiums have been able to implement a comprehensive energy retrofitting, although it is common practice for individual owners to insulate only their portion of the façade.

### On-going results from case study

A principle agreement on a pilot site owned by Pernik's municipality near Sofia was obtained at the end of March 2010. Also, a principle financing agreement was obtained with EBRD, and BHA (SHO) has been working actively with potential ESCO (especially Dalkia-Bulgaria JSCo) since project inception. However, it appears that the rent level and solvency of tenants at the site identified would not allow to repay ESCO investments and no ESCO would agree to take the risk at this site. Considering that no pilot site could be found within a reasonable delay, discussions have been initiated to modify the scope of activities in Bulgaria.

# 3 OBSTACLES AND CONDITIONS FOR UP SCALING

EPC scheme presented above and its adaptation to France, UK and Italy could be used to finance massive energy retrofitting of the housing. Yet, it is largely limited by a series of obstacles which concern:

- on the one hand the demand side, subject to regulations which need to be adapted
- on the other hand, the supply side needs to be stimulated in order for the ESCO sector to develop a new offer meeting the needs of Factor 4.

## 3.1 REGULATIONS

### Recoupment of energy savings from tenants

The major problem SHO's are facing in energy retrofitting is that they are not allowed to recoup energy savings from tenants. Except for a few countries (e.g. Sweden), regulations prohibit any attempt to do so. The exceptions introduced in the French and Italian regulations still present important weaknesses.

### Italy: recoupment of 100% of energy savings upon agreement of tenants

In the Italian system, already represented as scenario 3, the SHO can recoup 100% of energy savings from tenants if all tenants give their agreement. As a result of negotiation processes, SHO's tend to recoup less than 100% of energy savings. Recouped savings are a stable amount.

### France: recoupment of 50% of energy savings for 15 years

The French system enables to recoup energy savings, but limited to 50% for 15 years, without energy inflation. The agreement of tenants is not required, but a consultation has to be carried out. Though the French law constitutes an interesting first step towards financing energy retrofitting through energy savings in social housing, the limits currently imposed by the law reduce sharply the financial interest for comprehensive refurbishment through an EPC scheme.

### Recoupment scenarios

Figure 6 below represents different possibilities to recoup energy savings from tenants. These scenarios are based on a theoretical 50 m² dwelling with initial energy consumption of 300 kWh/m².a and an energy price of 0.05 Euro/kWh. We consider an energy retrofitting that generates 200 kWh/m².a savings and costs 25,000 Euros, financed totally through a 25 years loan at 4% interest. Future energy savings are calculated with 3% annual energy inflation, which is a conservative hypothesis, considering current trends.

If we consider that 100% of the avoided energy costs can be recouped from tenants until the initial investment is repaid, under our hypothesis, energy savings cover the direct investment costs (25,000 Euros) after 31 years. If added the financial costs (15,000 Euros interest for the loan under our hypothesis), the total investment costs (40,000 Euros) is repaid by energy savings after 41 years[18].

We now consider different legal scenarios for the recoupment of energy savings, depending on the share of recouped savings, the duration of recoupment and the indexation of recouped savings on energy prices. For each scenario, we calculate:

- the distribution of energy savings between tenants and SHO (used to pay the ESCO) over 40 years (which is almost the payback period as calculated earlier),
- the share of total investment costs (investment and financial costs) assumed by SHO which is financed by the energy savings recouped from tenants.

In the French legal framework, 50% of energy savings are recouped for 15 years without indexation. In that case, the SHO recoups 10% of the overall energy savings for tenants, which finance 9% of the total investment costs (scenario 1).

In a scenario where the recoupment duration could be extended to 25 years, 50% of energy savings (without indexation) would represent 16% of total investment costs (scenario 2).

In a scenario where the recouped energy savings were indexed on energy prices, it would be easier to negotiate with tenants initially, but indexation would need to be capped to protect tenants in case energy prices rise sharply, With 3%/a energy inflation (i.e. a capped hypothesis), 50% of energy savings recouped during 25 years would represent 23% of total investment costs (scenario 3).

[18] We exclude in this simulation, variations in operation and maintenance costs, though it can significantly change the final costs for tenants over a 40 years period.

Finally, recouping 100% of energy savings indexed on energy prices obviously constitutes the most efficient option to finance comprehensive energy retrofitting. Yet, it should not be forgotten that reducing energy costs for social housing tenants' is essential to fight fuel poverty and improve living conditions for the poorest parts of the population.

Recouping 100% of energy savings presents however two major difficulties:

- Even though they do not pay for the investments, it is necessary that tenants make actual monetary savings in order to be actively involved in responsible behaviour,
- It is difficult for tenants to accept that something they do not see (not consumed energy) is getting more expensive.

An acceptable compromise (scenario 4) could be therefore to recoup 100% of initial energy savings, without any indexation, so that tenants would progressively be saving money as energy prices increase. Energy savings would thus finance 31% of the total investment costs, while tenants would already benefit of 14% savings on the 5$^{th}$ year, and 52% on the 25$^{th}$ year. The major danger is that energy inflation, which is likely to be more than 3%/a, could delete the monetary savings for tenants, thus creating discontent and increasing risks of fuel poverty.

Another compromise (scenario 5) could be to recoup 80% of energy savings indexed on energy prices for 25 years. In that case, tenants would be incentivised to save energy, as they would get 20% of savings from the beginning of the contract, and 39% over 40 years. Energy savings would thus finance 38% of the total investment costs.

| | **Scenario 1** | **Scenario 2** | **Scenario 3** | **Scenario 4** | **Scenario 5** |
|---|---|---|---|---|---|
| % of recouped energy savings | 50% | 50% | 50% | 100% | 80% |
| Duration of the recoupment | 15 | 25 | 25 | 25 | 25 |
| Indexation of recouped savings | 0% | 0% | 3% | 0% | 3% |
| % financed by energy savings | 9% | 16% | 23% | 31% | 38% |
| Share of savings for SHO over 40 years | 10% | 16% | 24% | 32% | 39% |
| Share of savings for tenants over 40 years | 90% | 84% | 76% | 68% | 61% |

**Table 1: Scenarios for recoupment of energy savings**

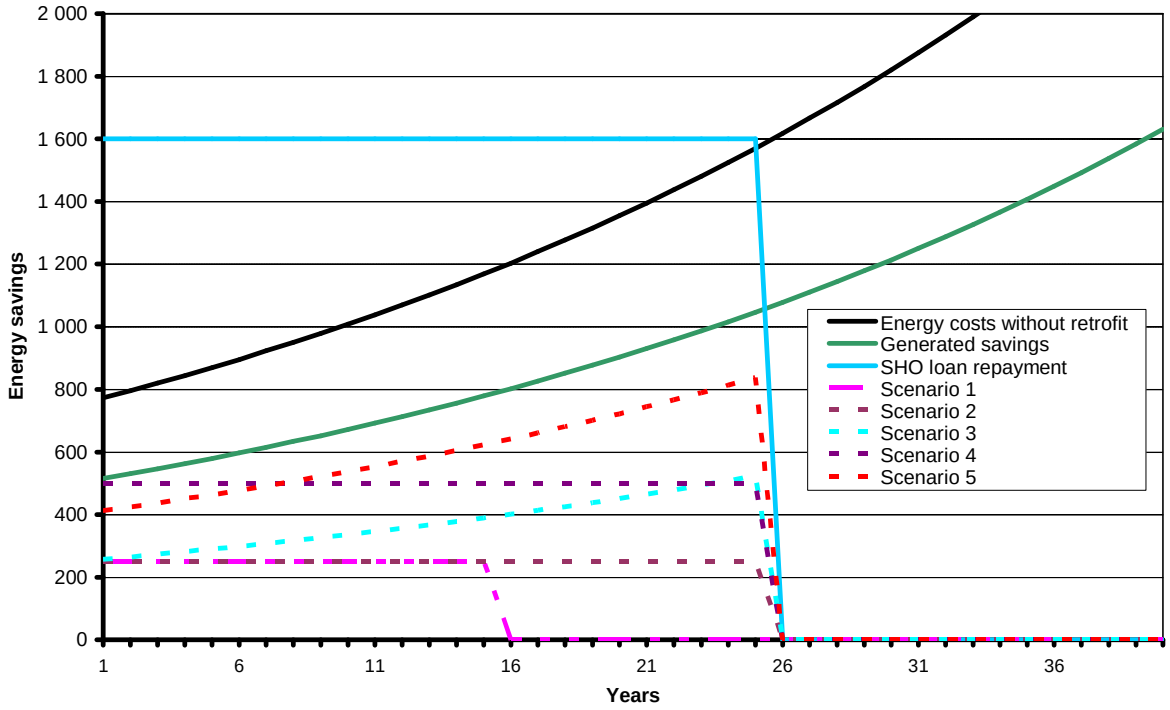


**Figure 6: Amount of energy savings recouped yearly under different scenarios**

### Recommendations for public regulations

Even though it raises many political questions to recoup energy savings from tenants, the economic point of view cannot be ignored as it is the major obstacle to use energy savings as a financial resource for Factor 4. From an economic point of view, the following mechanisms could therefore be introduced:

- "Warm rents", a system in which tenants pay a total fee for their rent and energy charges, thus enabling the SHO to transfer energy costs to rents after an energy retrofitting
- The possibility for SHO's to recoup up to 100% of energy savings from tenants, based on a performance guarantee
- The possibility to index the recouped savings on energy prices
- The possibility to recoup energy savings during the whole payback period of the investment, whether energy inflation is taken into account
- The possibility to recoup energy savings without the official agreement of all tenants

## Equal access to public incentives

SHO's benefit from various public supports, linked to their general interest mission and their specific statute: tax exemptions, subsidies, low interest loans… This results in an additional cost of EPC's for social housing operators, which is an obstacle to their replication.

In the French context, this is particularly important because of the public policies in support of social housing. For half of the social housing stock, an EPC with ESCO financing would require to implement a public-private partnership procedure (PPP), which would entail an additional cost of up to 39%: VAT would rise from 5.5% to 19.6% (VAT rate for services applies in PPP's), and the SHO's could not

deduct 25% of investment costs from local taxes.

Even though public support to social housing is essential and necessary, it appears that regulations should be adapted in order to enable EPC providers financing energy retrofitting in social housing to have the same advantages, which would not be linked to their statute but to the activity they are carrying out. It seems justified by the fact that social housing tenants remain the final recipient of the energy savings, and that ESCO would not be substituting to social housing operators but rather working on their behalf.

## 3.2 STRUCTURING AN EPC OFFER TO REACH THE FACTOR 4 [19]

If implemented in accordance with current market practices, EPC may focus only on the profitable investments, thus endangering the possibilities to finance more ambitious energy retrofittings. It seems therefore necessary for public authorities to structure the EPC offer, in order to create schemes capable to serve the collective target of Factor 4.

### The emergence of an integrated offer for EPC

The creation of Third Party Financing Operators (TPFO's) playing a role as skill assemblers appears to be necessary to respond adequately and massively to the demand for EPC's. Their role would be to assess the feasibility for an EPC, structure the financing and bear the risk of the contract, whose operational components would be outsourced to the relevant actors: construction companies, operators, etc... (see figure 5). TPFO's would be endowed with the legal, financial and technical resources necessary to the implementation of EPC's.

[19] Those recommendations are freely inspired from CDC 2010.

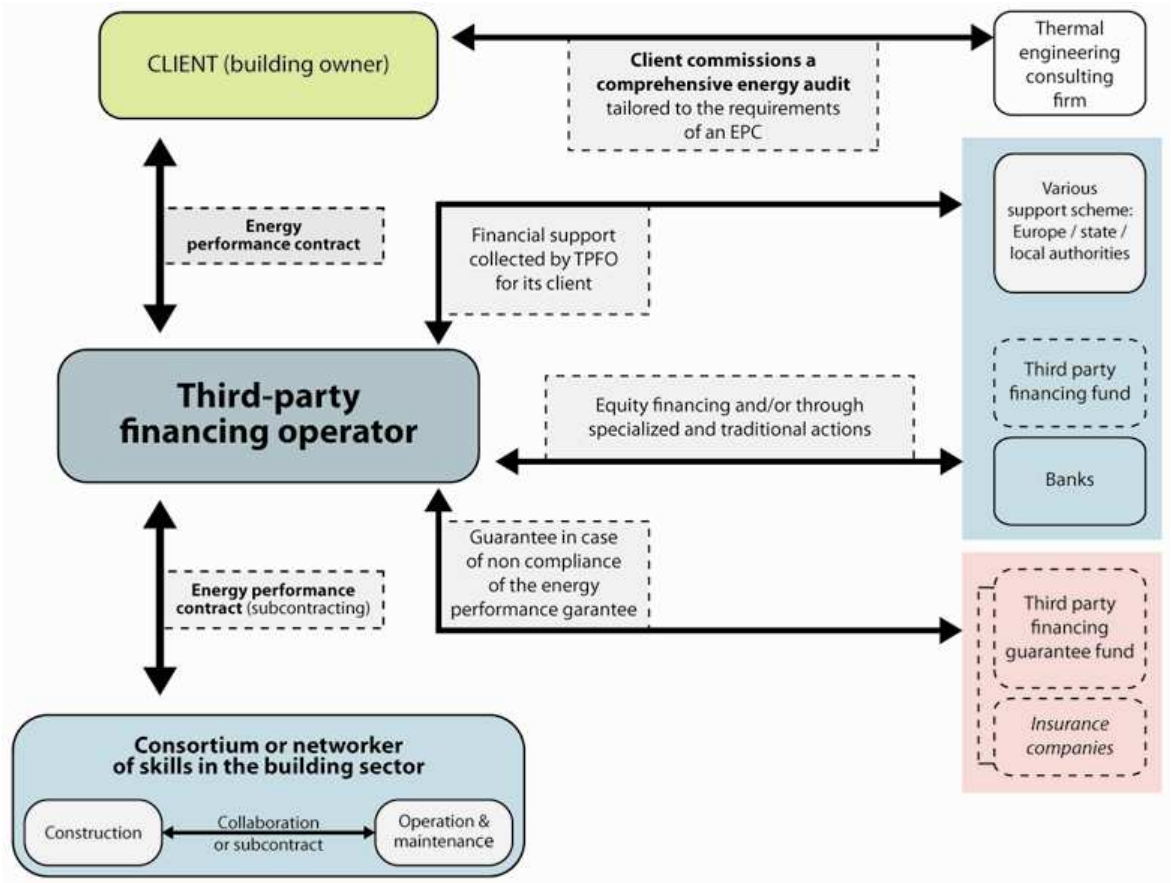


**Figure 7: Possible Scheme for Third Party Financing Operator (from CDC 2010).**

The emergence of TPFO would:

- Reduce the costs associated with the creation of consortium and project vehicles, whether by preserving the same structure or creating project companies from a template model;
- Facilitate the access for Small and Medium sized Enterprises (SME) to EPC subcontracting markets, which are currently mostly limited to a small number of major companies due to the size of the investments.

## 3.3 DEVELOPING FINANCIAL ENGINEERING TO REACH FACTOR 4

The requirements from banks and other financial institutions are too high to be met in comprehensive refurbishment investments at current energy prices. Considering the urgency to refurbish massively at very low energy consumption standards, specific Third Party Financing Operators (TPFO) should also be developed in order to manage large investments with low profitability in very long term commitments.

### A public impulse

The Return On Equity (ROE) associated with comprehensive energy retrofitting is lower than usual practices, and the payback period longer. However, as energy savings are contractually guaranteed in an EPC, once the first years of the contract have proved the savings, the overall contract performance could be considered close to the one of a public bond.

Therefore, public entities (State, Local Authorities,…) seem to be relevant investors for investing in such specific TPFO. Though the creation of public TPFO does not exclude the possible participation of private capital, the presence of public entities as stakeholders contributes to a greater credibility of the structure in front of the owners, whether they are public entities, social housing operators or condominiums. Indeed trust in the operator is essential for the inception and generalization of long term EPC's.

## Different levels of ambition in an EPC portfolio

A TPFO could manage a portfolio of operations with variable ambition and profitability. Some EPC's with higher profitability could compensate the lower profitability contracts so that the overall performance of the portfolio would remain acceptable. Managing a large portfolio could help overcome the logic which focuses only on the most profitable contracts. This seems to be the logic implemented by FEDESCO in Belgium, though the global payback period appears to be lower than 10 years (CDC 2010).

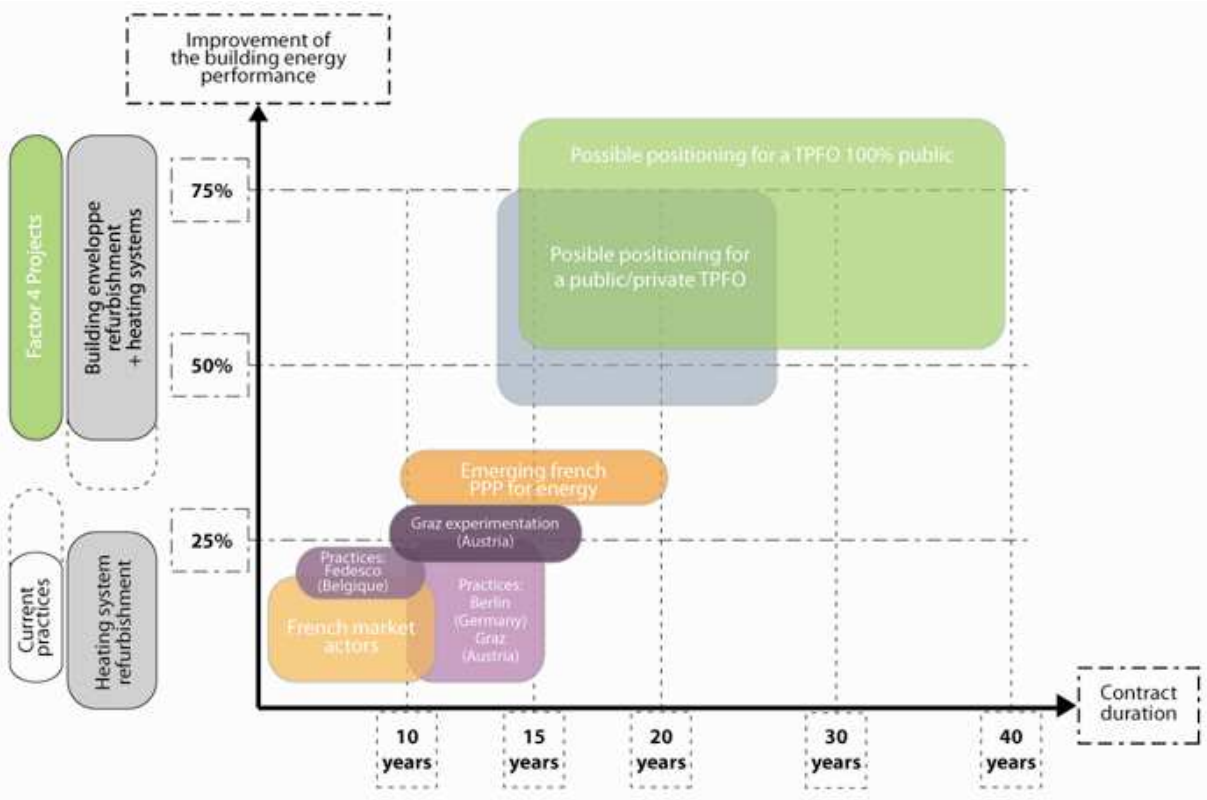


**Figure 8: Market positioning for Third Party Financing Operators (from CDC 2010)**

## Mobilising low-cost financing

A public TPFO will finance a large part of its investment by debt. Its financing modalities are to be invented but could be based on:

- The mobilization of subsidised loans such as those granted by Caisse des Dépôts et Consignations in France, KfW in Germany, the High Energy & Environmental Quality Facility by the European Investment Bank, or EBRD loans in new Member States;
- The creation of investment funds with reduced yield but higher environmental benefit,

whether they are based on the Socially Responsible Investments (SRI) concept, or community savings (e.g. SOLIRA in France)

- debt securitization and emission of bonds for periodical refinancing

## Mobilising ERDF grants for capitalising a revolving fund (JESSICA)

JESSICA is a financial mechanism created in 2006 by the European Investment Bank (EIBI). It allows member states to:

- Mobilise grants from European structural funds (European Regional Development Fund and European Social Fund) in order to capitalise funds dedicated to urban development investments,
- Conserve any returns/receipts generated from the investments made in urban development in the dedicated urban development funds or return them to the managing authorities for reinvestment in new urban regeneration projects,
- Associate private capital.

Use of JESSICA funds could be used by way of either equity, debt or guarantee investment, eventually combined.

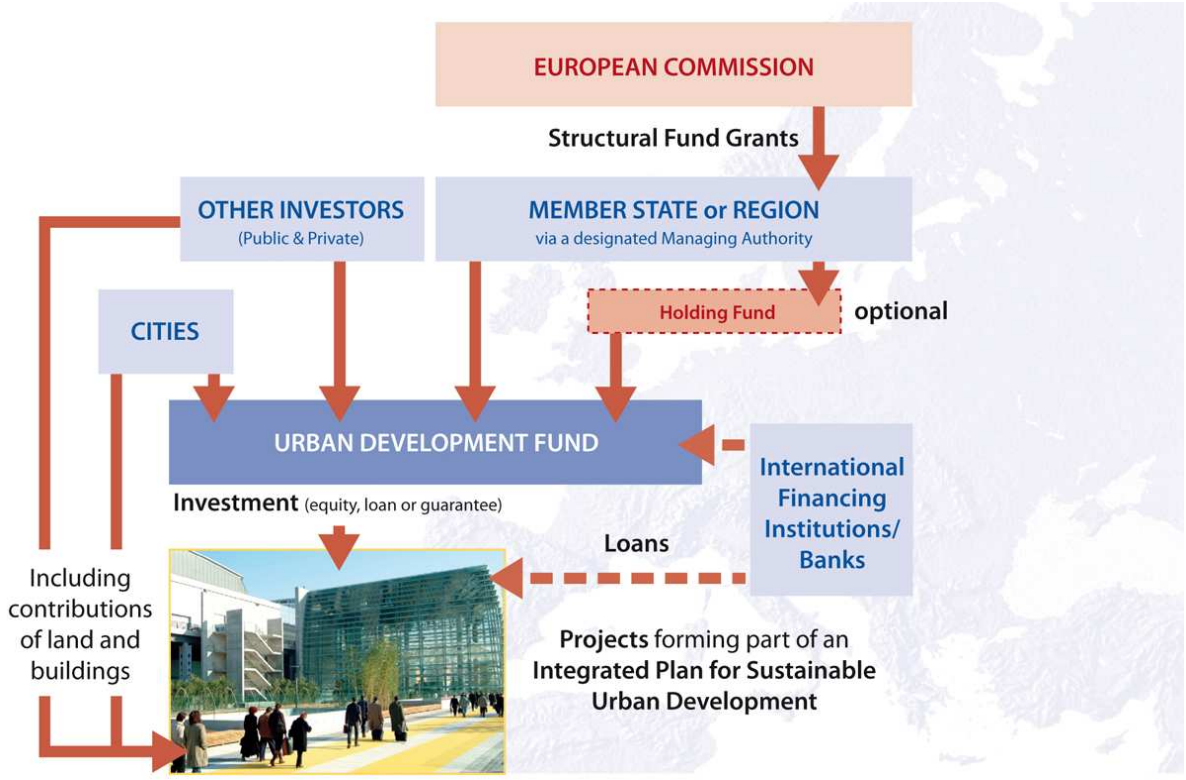


**Figure 9: How JESSICA funds are channelled (EIB 2008)**

Funding for EPC projects in social housing would probably be eligible as energy retrofitting of social housing is eligible under the European Regional Development Fund since 2009. To our knowledge, JESSICA has already been mobilised for energy renovation of social housing in the UK and Estonia.

The modalities of implementation of this mechanism and its possible application to EPC are still to

assess. It seems largely compatible with the other elements of financial engineering proposed earlier.

### Mobilising the new European fund for renewable energies

This fund was voted by the European Parliament on 11 November 2010. It intends to assist regional and local authorities in financing projects that are economically and financially viable. According to Antonio Cancian, this fund could represent nearly 146 million Euros. EPC should be eligible as projects for the "Renovation of buildings to improve energy efficiency". The funds will be available from 1st January 2011 and must be granted before 31st March 2014.

Contributions from the fund would be in the form of loans, guarantees, equity or other financial products. In addition, up to 15% of funding can be used to assist governments to implement projects through technical assistance. The EIB also appointed the geographical equilibrium as an important criterion for selecting projects. The goal is that each project, once the point of equilibrium is reached, can be a source of profitability, by refunding the amount financed to the fund.

# 4 CONCLUSION

Given the context of rising energy prices, fuel poverty affecting millions of households across Europe and the need to mitigate climate change, it is crucial that the existing housing stock, and notably social housing stock, be massively refurbished at very low energy standard. Considering refurbishment trends, reaching the "Factor 4" objectives requires developing new adapted funding to generalise low energy refurbishment.

Funding could be found through Energy Performance Contracts (EPC) with third-party financing: the business model is still largely to be defined in the social sector but the potential is huge. FRESH project partners are currently working out the legal, financial and technical framework for EPC's in social housing and should sign the first pilot contracts during the 1st semester 2011. Implementation handbooks including template contracts will then be published on the project website.

The major problem SHO’s are facing in energy retrofitting is that they are not allowed to recoup energy savings from tenants. Even though it raises many political questions, this limit should not be ignored as it is the major obstacle to use energy savings as a financial resource for Factor 4 in social housing. It should also be noted that if implemented based on current market practices, EPC’s may focus only on the more profitable investments, thus endangering the possibilities to finance more ambitious energy retrofittings. It seems therefore necessary for public authorities to intervene and help structure Third Party Financing Operators, in order to create schemes capable to serve the collective target of Factor 4. The challenge of a 75% reduction of greenhouse gas emissions cannot be met without a deep reorganization of regulations and governance which currently prevent investments in energy efficiency.

# GLOSSARY

ESCO: Energy Service Company

EPC: Energy Performance Contract

EU: European Union

SHO: Social Housing Operator

TPFO: Third Party Financing Operator

PPP: public private partnership

# REFERENCES

CDC 2010. “Utiliser le Tiers Investissement pour la rénovation thermique du patrimoine bâti français”, Caisse Des Dépôts et Consignations, May 2010.

CECODHAS 2007. “Housing Europe 2007. Rapport sur le logement social, le logement public et le logement en cooperative dans les 27 Etats membres”. www.cecodhas.org.

DG-TREN 2007. “European energy and transport - Trends to 2030, update 2007”, Directorate-General for Transport and Energy (DG-TREN), 2007.

EC 2010. “General budget of the European Union for the financial year 2010 - The figures”, European Commission, 2010.

EIB 2008. “JESSICA: A new way of using EU funding to promote sustainable investments and growth in urban areas”, European Investment Bank, 2008.

EUROCONTRACT 2008. "Comprehensive Refurbishment of Buildings with Energy performance Contracting", Graz Energy Agency, Berlin Energy Agency and Austrian Energy Agency, 2008.

FACTOR 4. “Factor 4: Doubling wealth – halving resource use: a report to the Club of Rome", Earthscan Publications Ltd., London, 1997

FEDERCASA 2006. “Housing statistics in the European Union 2005/2006”, Federcasa, 2006.

IDDRI 2010. “Habitat Facteur 4. Étude d’une réduction des émissions de CO2 liées au confort thermique dans l’habitat à l’horizon 2050”, Institut du Développement Durable et des Relations Internationales (IDDRI), Les cahiers du CLIP n°20, November 2010.

INSEE 2008. D. BESSON, “Consommation d’énergie: autant de dépenses en carburants qu’en énergie domestique”, INSEE Première n°1176, Februar y 2008.

JRC 2007. P. Bertoldi, B. Boga-Kiss and S. Rezessy "Latest development of ESCO’s across Europe - a European update", Joint Research Center (JRC), 2007.

TACKOBST 2007. “Newsletter #1”, TACKOBST project, Spring 2007, http://www.tackobst.eu/publications-1/newsletter-nb01-spring-2007/view

UNECE 2001. “Housing statistics”, United Nations Economic Commission for Europe (UNECE), 2001.

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