

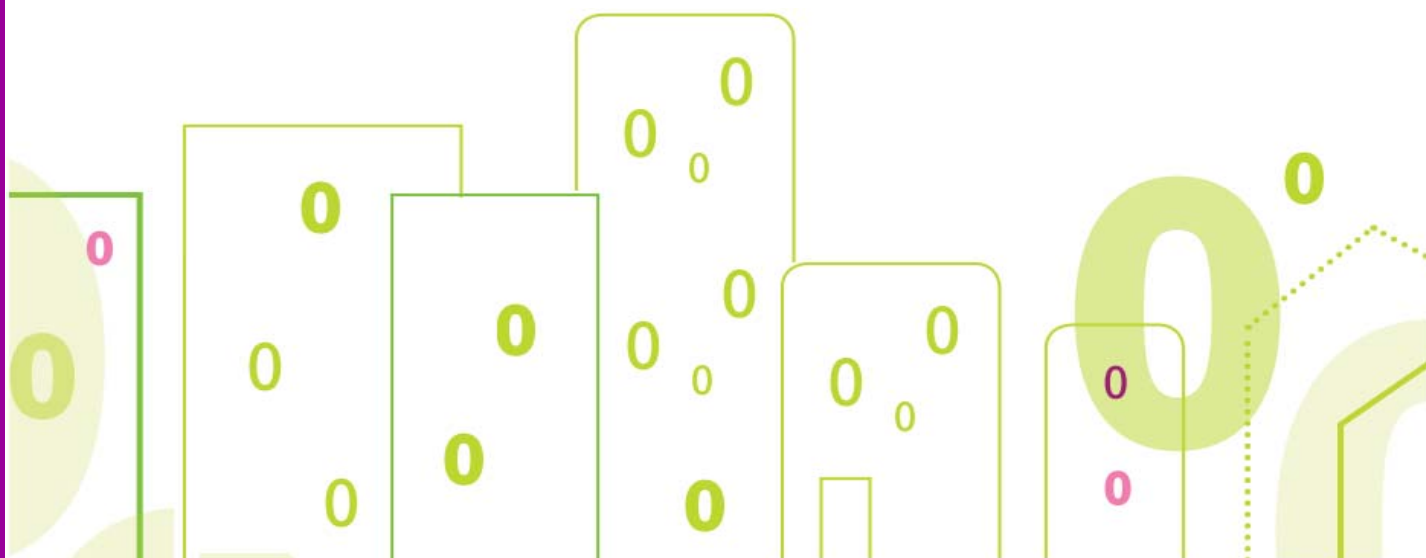
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**NEARLY  
ZERO  
ENERGY**  
HOUSING IN  
DIVIDED OWNERSHIP

## THE NEARLY-ZERO ENERGY CHALLENGE IN DIVIDED AND COOPERATIVE OWNERSHIP

Financing nearly-Zero Energy projects and  
Renewable Energy Sources in Divided and  
Cooperative Ownership



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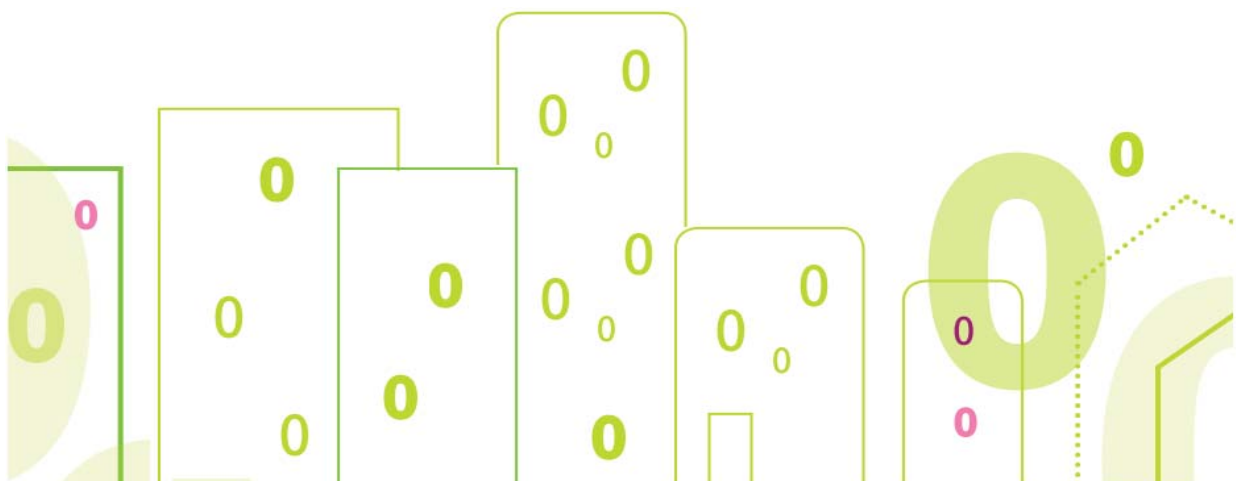
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## Annexes

See document "Annexes - Financing nearly-Zero Energy projects and Renewable Energy Sources in Divided and Cooperative Ownership" downloadable from the following link:

[http://www.powerhouseeurope.eu/nearly\\_zero\\_taskforces/nzeb\\_in\\_dividedcooperative\\_ownership/key\\_outputs\\_and\\_resources/](http://www.powerhouseeurope.eu/nearly_zero_taskforces/nzeb_in_dividedcooperative_ownership/key_outputs_and_resources/)

## 1 Introduction

In this document, two of the *hot topics* of this Taskforce will be faced: Financing nZEB and Renewable Energy Systems.

The document is divided in two parts, one for each *hot topic*. Part one is dedicated to financing systems: there is an overview of major financing and subsidising schemes for energy efficiency currently used in Europe, especially suitable for multifamily buildings where the property is divided between several subjects or cooperative. This work is based on the outcome of the international workshop held in Milan on the 11<sup>th</sup> of June 2013 “How to finance energy efficiency? Focus on divided and cooperative ownership multifamily buildings”. The document then presents how financing/subsidising schemes and schemes to promote RES have been used in practice in the case studies selected for this project in Bulgaria, Estonia and Italy ([see the updated list on the POWER HOUSE Website](#)).

Another chapter dedicated to the situation in each of the three Countries, where it will be reported from the point of view of a selected number of national experts and housing managers, plus a paragraph with the position of the national association which is partner of the POWER HOUSE Project; this is actually part of the national roadmap (ref. WP 6). The document concludes with a paragraph where we try to summarize the results of this work for divided and cooperative property at EU level.

In addition, the document includes three annexes, one in each national language of the three Countries, where the currently nationally available financing and subsidizing schemes are described, and where it is clarified the usability of each scheme in the 4 scenarios (ref. Del 3.1 chap. 2.1): Divided ownership/ Renovation project, Divided property/ new built project, Cooperative ownership/ Renovation project and Cooperative property/ new built project.

Part B follows a similar structure as part A, beside the initial EU-overview chapter is missing.

## 2 Part A Financing nZEB

NZEB has higher construction costs and lower energy costs than a normal building. The same is true in case of a renovation project. In addition, nZEB might have higher maintenance costs, especially in the case where new technologies are used improperly. An accurate budgeting is then necessary to demonstrate the feasibility of the project.

### European overview

There are number of successful experiences of financing energy efficiency in different European countries. Some of them were presented at the international workshop “*How to finance energy efficiency - focus on divided and cooperative ownership multifamily buildings*” on 11- 12 June 2013 in Milan, Italy. The workshop gave an overview of successful schemes and financial measures available in different European countries for incentivising and implementing energy efficiency refurbishment.

Experiences from different European countries show that:

- ✓ having a stable financial base is essential for a scheme to guarantee continuity and credibility over several years as can be learned from KredEx’s renovation loan in Estonia and Austria’s refurbishment check programmes;
- ✓ energy monitoring needs to be a mandatory requirement to ensure that calculated energy savings are actually reached;
- ✓ ERDF structural funds can be effectively used to tackle energy efficiency as in the case of refurbishing HLMs in France. Housing providers need to collaborate and work with the government and other stakeholders to make energy efficiency a priority investment and use the funds for financing refurbishment of existing dwellings;
- ✓ there is a need for incentives to promote innovation in the construction sector to lower investment costs and promote housing affordability;
- ✓ it is important to take a holistic, integrated approach in promoting energy efficiency.

For more information a full report on the workshop is available [here](#).

## Experiences from case studies

In the following paragraphs will be presented how the financing/subsidizing schemes have been used in practice in the selected case studies in Bulgaria, Estonia and Italy. For each case study, there will be included:

- Title as on POWER HOUSE Website and link to it,
- Name of the implemented scheme,
- Description the measure(s) which have been implemented thanks to the scheme,
- Description of the financial/ subsidize benefits provided by the scheme,
- Who benefits of what and if there are other agreements between the beneficiaries (for example the housing company/ the families/ the energy provider, etc.).

### ✓ **Bulgaria**

#### **Energy renovation of existing condominium apartment building – Zaharna Fabrika estate bl. 11 – Sofia**

**Implemented scheme:** Renovation subsidy for condominium homeowners in the amount of 75 % of the total project cost, offered by the National Renovation Program

#### **Main points of interest**

- The case study refers to an energy retrofitting of a multi-family condominium building located in Sofia;
- The building is of a multi-storey apartment type (condominium), no formal association of apartment owners was established;
- The project was carried out because of the high price for heating and the uncomfortable indoor climate. The building is with individual heating provided by electrical appliances. The hot water is provided by electric boilers;
- Financed measures:
  - ✓ Insulation of external walls with 8 cm EPS with U value=0.335W/m<sup>2</sup>K;
  - ✓ Insulation of pitched roof with 15 cm mineral wool with U value=0.23W/m<sup>2</sup>K;
  - ✓ Insulation of the first floor with 8 cm hard mineral wool plates with U value=0.38W/m<sup>2</sup>K;
  - ✓ Solar collectors have been installed on the roof for hot tap water.

Financed measures for building energy renovation comprise a complete refurbishment of the building envelope – thermal insulation of the external walls, the roof, the ground slab and

replacement of the window frames with PVC double glazing and installing of solar collectors. The project also includes renovation of the common areas – staircases, front door and building installations.

As a second stage solar collectors for domestic hot water were installed on the roof of the building.

### Description of the financing scheme

- Initial energy audit financed by the National Renovation Program (Obnoven Dom project) has been carried out in order to obtain a baseline consumption data and get the calculation about complex renovation;
- The National Renovation Program (Obnoven Dom project) provides 75% subsidies for complex renovation including solar collectors;
- The flat owners pay the remaining 25% cost using own resources;
- The flat owners are direct beneficiaries of the subsidy; they received increased property value, comfortable and healthy indoor climate with 52% energy use reduction. The achieved reduction in greenhouse gas emissions is 62 t/y;
- Solar collectors are subsidized by the National Renovation Program (Obnoven Dom project).

### Energy renovation of existing condominium apartment building – Madrid 11 – Sofia

**Implemented scheme:** Renovation subsidy for condominium homeowners in the amount of 75 % of the total project cost, offered by the National Renovation Program

### Main points of interest

- The case study refers to an energy retrofitting of a multi-family condominium building located in Sofia;
- The building is of a multi-storey apartment type (condominium), no formal association of apartment owners was established;
- The project was carried out because of the high price for heating and the uncomfortable indoor climate;
- Financed measures:

External walls have been insulated with 80 mm foam polystyrene (EPS  $\lambda = 0,026$  W/mK). Financed measures for building energy renovation comprehend a complete refurbishment of the building envelope – thermal insulation of the external walls, the roof, the ground slab and



replacement of the window frames with PVC double glazing. The project also includes renovation of the common areas – staircases, building installations, heat exchanger, etc.

As a second stage solar collectors for domestic hot water will be installed on the roof of the building.

### Description of the financing scheme

- Initial energy audit financed by the National Renovation Program (Obnoven Dom project) has been carried out in order to obtain a baseline consumption data and get the calculation about complex renovation;
- The National Renovation Program (Obnoven Dom project) provides 75% subsidies for complex renovation;
- The flat owners pay the remaining 25% cost from own resources;
- The flat owners are direct beneficiaries of the subsidy; they received increased property value, comfortable and healthy indoor climate with 42% energy use reduction;
- Solar collectors to be installed will be subsidized by the National Renovation Program (Obnoven Dom project).

✓ **Estonia**

### Energy refurbishment of 30 dwellings in Õismäe str 11, Tallinn

**Implemented scheme:** Reconstruction Grant for associations and communities in the amount of 35 % of the total project cost, offered by Fund KredEx

### Main points of interest

- The case study refers to an energy retrofitting of a multi-family buildings located in Tallinn;
- The building is a divided ownership type, operated as association;
- The building was already in the status with need of maintenance work of the facades heating system and ventilation;
- Financed measures:
  - External walls have been cladded with 150 mm foam polystyrene (EPS  $\lambda = 0,031$  W/mK);
  - Heating system has been replaced with two pipe system, new radiators installed;

- Ventilation system was built by using heat recovery ventilation based on exhaust air;
- Solar panels have been installed on the roof for hot tap water.

### Description of the financing scheme

- The apartment association has been monitoring the energy consumption of the building and ordered the energy audit in order to obtain a baseline consumption data and get the calculation for full-scale renovation;
- The Fund KredEx provides 35% subsidies for complex renovation;
- The flat owners pay the remaining 65% cost and have fixed interest loan for 20 year;
- The flat owners are the beneficiaries of the financing schemes; they will receive high value property and comfortable and healthy indoor climate with 50% energy use reduction and even more from solar energy for hot tap water production.

### Energy refurbishment of 40 dwellings in Võidu str 42, Rakvere

**Implemented scheme:** Reconstruction Grant for associations and communities in the amount of 35 % of the total project cost, offered by Fund KredEx

### Main points of interest

- The case study refers to an energy retrofitting of a multi-family buildings located in Rakvere;
- The building is a divided ownership type, operated as association;
- The building was already in the status that need of maintenance work of the facades, heating system and ventilation;
- Financed measures:
  - External walls have been cladded 150 mm foam polystyrene (EPS  $\lambda = 0,031$  W/mK);
  - Heating system has been replaced with two pipe system, new radiators installed;
  - Ventilation system was built by using heat pump recovery ventilation based on exhaust air.

### Description of the financing scheme

- The apartment association has been monitoring the energy consumption of the building and ordered the energy audit in order to obtain a baseline consumption data and get the calculation about complex renovation;
- The Fund KredEx provides 35% subsidies for complex renovation;
- The flat owners pay the remaining 65% cost and have fixed interest loan for 20 year;

- The flat owners are the beneficiaries of the financing schemes; they will receive high value property and comfortable and healthy indoor climate with 50% energy use reduction.

✓ **Italy**

### Energy refurbishment of 38 dwellings in Via dei Querci, 2 Florence

#### **Main points of interest**

- The case study refers to an energy retrofitting of a multi-family buildings located in Florence;
- the building is a divided ownership type;
- the building was already in need of maintenance work of the facades;
- Financed measures:
  - External walls have been cladded with Graphite-EPS ( $\lambda = 0,031 \text{ W/mK}$ ), thickness 9 cm. The entire system has been insured.
  - The old heat generator (gas boiler) has been replaced with a new one (3 star, 190,4 kW of nominal power, thermal performance 94,5 – 97,5%). The work included the renovation of all the accessories; new exhausted fumes duct in stainless steel; new electric system in the heater room.

#### **Description of the financing scheme**

- The housing Company has been monitoring the energy consumption of the building, in order to obtain a baseline consumption data;
- the housing company finances the extra cost for the energy retrofit measures;
- the flat owners pay the remaining cost for maintenance work of facades;
- the housing company signed an Energy Performance Contract (EPC) with the householders: flat owners keep paying for energy as before the intervention, while the housing company keeps for itself the difference between the real consumption and the baseline consumption: this difference was estimated being larger than 30%.
- the housing company provides assistance to the flat owners to access financial subsidy, tax deduction of the 55% of the energy retrofit costs;
- the flat owners are the beneficiaries of the financing schemes, they will receive tax deductions.

### New construction of 142 dwellings in Bazzana Inferiore, Assago (MI)

#### **Main points of interest about the project**

- the building belongs to cooperative ownership;

- space and water heating is done by mean of geothermal heat pumps, which during the summer also provide for space cooling;
- the heat pumps are water / water, using as cold source the superficial underground water;
- a 20 kWp PV system has been installed, the modules being positioned on the tilt roof. Part of the energy is used for the heat pumps; part is released into the grid. The system benefits of a feed-in tariff.

### Description of the financing scheme

The PV system will benefit of the 5<sup>th</sup> Feed-in tariff.

- The 5<sup>th</sup> feed-in scheme applies to plants with a capacity of at least 1 kW, commissioned from 26 August 2012. PV systems must be grid-connected;
- the **feed-in tariff** is based on the electricity produced. The tariff differs depending on the capacity and type of plant and is granted over a **period of 20 years**;
- for system commissioned **within 31 December 2012**, the scheme (called feed-in premium) provides for a tariff for the electricity produced. The electricity fed into the grid may be purchased by GSE (*ritiro dedicato*) or economically offset with the value of electricity withdrawn from the grid (net metering - *scambio sul posto*) service;
- starting **from the first half of 2013** and on, the tariff will be made up of both the incentives and the value of electricity. A specific tariff will be applied to the self-consumed electricity;
- In this case, the cooperative benefits of the financing.

### New construction of 18 dwellings in Via Fenil Novo Molini, Brescia

#### Main points of interest about the project

- the case study refers to two buildings that belong to cooperative ownership, multi-family type;
- each of the 2 buildings is equipped by 20 kWp PV systems;
- The PV systems are funded by the 2<sup>nd</sup> Feed-in Tariff scheme

#### Description of the financing scheme

- The Housing Company provide the building with a PV systems;
- The Housing Company required incentives in the framework of the 2<sup>nd</sup> feed-in scheme;
- The 2<sup>nd</sup> feed-in scheme applies to plants with a capacity of at least 1 kW, commissioned between 21 February 2007 and 30 June 2011. PV systems must be grid-connected;
- A feed-in tariff is paid for the electricity generated by photovoltaic plants. The tariff will cover a period of 20 years, starting from the plant commissioning date;
- Furthermore, the PV system uses net-metering service and benefits also of a tariff deriving from the injection of surplus produced energy into the grid;

- The Housing Company is receiving the incentives.

### The situation in the 3 Countries

#### ✓ Bulgaria

CAC contacted several Bulgarian experts who are involved in energy efficiency issues. Also active homeowners from condominium buildings were approached to get their opinion on the theme of financing/subsidising for energy efficient renovation and introduction of RES systems.

Interviews with experts and homeowners were conducted by e-mail and by phone.

#### *Input from the experts*

Energy efficient renovation of existing condominium buildings in Bulgaria has been a complicated issue due to the existing tenure structure (almost 100% condominiums in big cities) and extensive lack of proper building management legislation. Therefore few projects have been developed so far and the renovation activities in Bulgaria are lagging behind those in most EU countries.

Lack of legal framework:

- Existing legal framework in Bulgaria does not create incentives for proper management, maintenance and energy renovation of condominium buildings;
- Regulations regarding management and maintenance of condominium buildings do not oblige apartment owners to form homeowners associations (HOA). According to the new Condominium Law that was approved in 2009 there is a provision for voluntary registration of HOA but this is still not supported by sufficient incentives for the homeowners and subsequently this provision is practically not used by them. Since the approval of this law few HOAs have been registered;
- Apart from subsidy schemes, there are no specific legislation/incentives regarding use of possible third party financing schemes (EPC) in residential buildings in Bulgaria. The only existing regulations in the form of reference guidelines are issued by the Ministry of Regional Development and the Ministry for Economy and Energy in regard to public buildings energy efficient renovation.

## Financing/subsidizing schemes for energy efficiency and RES

### Problems that are discussed by the experts:

Low payment capacity of tenants (homeowners in condominium buildings) and lack of sufficient financial tools supporting renovation of existing residential buildings:

- Level of household income is insufficient to allow participation of residents in covering part of the costs for renovation – the average level of household income is the lowest among all EU member states and it has further decreased after 2009 due to the global recession (source – National statistical Institute – [http://www.nsi.bg/ZActual\\_e/BudgetHome1209.htm](http://www.nsi.bg/ZActual_e/BudgetHome1209.htm));
- The National Renovation Program (Obnoven Dom project) was making slow progress for a number of reasons and subsequently was cancelled due to the lack of budget funds;
- The EBRD funded credit line allowing 30% subsidy for building based energy renovation (project REECL – [www.reecl.org](http://www.reecl.org)) is practically not used due to the lack of proper legal environment (Condominium Law);
- The Bulgarian Energy Efficiency Fund - BGEEF ([www.bgeef.com](http://www.bgeef.com)) is not offering subsidies to condominium buildings but only loans or partial guarantees with market level interest with additional requirement for payback of investment in five year period – since the start of operation of BGEEF in 2005 no condominium building has been renovated with such financing;
- Bulgarian banks are not interested to finance condominium homeowners for energy efficient renovation of housing. The economic stagnation has further exacerbated the situation.
- The National Program for Energy Efficiency in Multi-family Apartment Buildings (2013- 2015) under the Operational Program Regional Development (2007-2013) has been delayed and currently two condominium buildings have been completed. The Program is offering up to 75% subsidy for energy refurbishment of condominium buildings by use of EU Structural Funds and Bulgarian state budget:  
[http://www.eufunds.bg/docs/\\_\\_\\_\\_%CE%CF%D0%D0.pdf](http://www.eufunds.bg/docs/____%CE%CF%D0%D0.pdf).

### Suggestions for future financing/subsidizing schemes:

The discussion regarding the scope and financial scheme of nearly zero energy concept for condominium housing has shown the potential for involvement of a third party financing model (EPC) to a certain extent.

Potential EPC contractors (mainly Overgas and Dalkia Bulgaria) have shown that a potential EPC partner is willing to get involved but in covering only a part of the total renovation costs of a comprehensive refurbishment program (NZEB) based on EPC (building systems plus insulation of building envelope). Involvement was offered for covering of the building systems cost (20% to 30% of the total costs). In order to get feasible financial scheme the remaining must to be covered by:

- Own resources/loans available to homeowners – in majority of cases it is unlikely that homeowners will be able to secure the needed own funds or loans due to a great diversity of income level of residents in condominiums;
- Subsidy – several subsidy programs available for refurbishment of condominiums up to the extent of 75% of costs (National Program for Energy Efficiency in Multi- Story Apartment Buildings 2013-2015 and REECL2).

### **Input from housing managers:**

The active homeowners that were interviewed were among the residents from pilot case studies and from other condominium buildings.

Main points of interest:

- It is still very difficult for homeowners to apply for a subsidy – complicated structure of approval process, inefficiency of the Condominium Law;
- Inability for a great number of homeowners to contribute both with own resources or to take out a loan due to low income and/or low assets;
- Very differentiated payment capacity of homeowners within a single apartment building.

### **Suggestions for future financing/subsidizing schemes:**

- The condominium Law should be improved allowing better organisation of homeowners within the apartment building.
- Administrative procedures to get involved in a subsidized renovation of a condominium building must be simplified.

### ***Project partner position***

#### **Overview of the problem of energy efficient renovation of Bulgarian housing**

During socialist times until 1989, like in most of other East European countries, new housing in Bulgaria was built predominantly by the Government in a set of tight limits in size and quality, which gives us grounds to consider all housing constructed during this period as social housing. Unlike other countries, during totalitarian government in the period 1945-1989, the State as a main developer used to build houses whose ownership was immediately transferred to the residents. Due to this peculiarity, Bulgaria was among the few countries with totalitarian system characterised by an extremely high owner occupancy share (currently about 97%).

In view of this very high share of private ownership, the housing sector in Bulgaria after 1989 was affected much more severely by the political and economic changes than in other countries from the block. Since there was almost nothing to privatize in housing sector, the ownership structure changed

insignificantly (State-owned rental housing went from 10% to 3% currently). 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 the homeowners themselves who are not formally organised in legally established homeowners associations. A major issue for housing policies is the lack of actors specialized in housing management.

In 2004 a National Housing Strategy was adopted by the government aiming to stop the process of deterioration of the existing building stock and to introduce a mechanism for the provision of new accessible dwellings (owned and rented). In 2005, a National Program for Renovation of the Housing Stock was approved by the government foreseeing budget subsidies for large-scale renovation activities of condominium housing.

The poor technical quality of the housing stock and the lack of investments in the past entail a high need for refurbishment in general, and energy retrofits in particular.

The barriers encountered during the implementation of renovation activities in Bulgaria can be summarized as follows:

### - **Legislation**

The most difficult barrier is the heavy, complicated and often ambiguous procedure for public procurement involving national subsidies and targeted EU funds. At the same time, the newly adopted Condominium Act needs further improvements especially in its part dedicated to incentivize the overall activity and the financial input on behalf of the homeowners' associations in condominium buildings to be renovated.

- Concerning the **financing** energy efficient housing renovation in Bulgaria

Considerable barrier is the lack of available and sufficiently flexible models for financial engineering that are needed to create tailor made mixture of different sources of funds including subsidies to cover the renovation costs.

### - **Capacity building**

There is still lack of capacity of professionals with knowledge and experience in financial engineering and contracting of construction works financed by public funds including subsidies.

The lessons learnt from the implementation of still small scale housing renovation activities of multi-story condominium buildings can be summarized as follows:

- The coordination of all project related activities is time and resource consuming due to the large number of stakeholders involved, diverse sources of available financing and the unique and complex nature of the activity;
- The possible multiplication and upscaling of the renovation activities will reduce the time and resources needed and thus, will increase the efficiency in technical and financial terms;



- The upscaling of the renovation activities will not only increase the financial efficiency but will enable residents' involvement and satisfaction from the improvement of their homes and living environment.

#### **Update December 2014:**

By the end of 2014 the status quo of the energy renovation of existing multi-story apartment buildings in Bulgaria is as follows:

- In July 2014 two condominiums were renovated within the National Program for Energy Efficiency in Multi-family Apartment Buildings (2013-2015): <http://bacc-bg.org/index.php/news-mainmenu/item/243-news-#4&Itemid=227>

The Program is planned to be closed in October 2015.

<http://www.mrrb.government.bg/?controller=category&catid=5>;

- EBRD Residential Energy Efficiency Credit Line <http://www.reecl.org/bg/index.php> is closed due to its full absorption.

#### ✓ **Estonia**

In July 2013, EKYL contacted some of the Estonian experts in the field of energy efficiency and managers of apartment associations and asked them to deal with the theme of financing/subsidizing both for energy retrofit and RES systems.

The interviews with experts were made by e-mail and additional questions and points of interest were discussed by phone when needed. The interviews with managers were made by phone.

#### ***Input from the experts***

#### **Financing/subsidizing schemes for energy efficiency and RES**

According to all the experts, the most successful financing scheme for energy efficiency is the Reconstruction Grant for apartment associations planning full-scale reconstruction. It is financial solution offered by Fund KredEx. The grant may be applied for in the amount of 15%, 25% and 35% of the total project cost depending on the level of integration in the reconstruction of the relevant apartment building.

The main points of success of the scheme are:

- gives new life for the 30-40 year old buildings, reduces living costs and makes house comfortable and healthy;
- addresses most problems simultaneously including substantial improvement of indoor climate;

- motivates the associations to implement complex renovation to achieve 50% savings;
- the grant may be combined with the renovation loan of KredEx to decrease the share of required self-financing, as well as with collected own funds;
- it is essential for renovating the old housing stock in Estonia. The amount really motivates the associations to renovate, so today there are more applications than money available.

### Negative aspects:

- long pay-back period;
- The change in energy prices makes difficult to calculate the pay-back time;
- the grant does not change the owners behaviour which will diminish the savings;
- the grant system is good but sometimes the owners themselves lack of knowledge about renovation, owner supervision and energy efficient behaviour. Definitely, there is more training needed for managers of apartment associations to make the right decisions with their building;
- today the acceptance of applications for grants has been closed due to the exhaustion of the financial means;
- In some cases efficiency was not achieved due alterations during construction work which made sense from the point of view of the owners but undermined the goal of achieving energy efficiency.

### Other financing schemes mentioned by the experts:

- energy audit, building design and building expert evaluation grant - issued for energy audits, building expert evaluations and building designs of reconstruction work based on energy audit;
- renovation loan - designed for the reconstruction and improvement of energy efficiency of apartment buildings constructed before 1993;
- apartment building loan guarantee - suitable for apartment buildings that wish to take a loan from a bank to finance renovation and work connected with increasing of the quality of life of inhabitants, but whose risk is evaluated higher than average by the bank.

### Suggestions for future financing/subsidizing schemes

- the reconstruction grant program should continue, because it is so far the most effective and motivation measure for rising the energy efficiency in blocks of flats;
- the grant should be flexible, depending on calculated savings;
- the subsidy system should take into account the real energy price and owners ability to make investment from their income;

- the training of construction professionals, especially building inspectors and project managers concerning specific requirements for renovation should be added to the program.

### ***Input from the managers of apartment associations***

All the managers who answered had received the reconstruction grant of 35% for the renovation of the multi-apartment building.

The main points of interest:

- it is not difficult for apartment association to apply for the grant but much extra preparation work is needed to motivate the owners to take the loan for renovation in the general assembly of the association;
- without the possibility to apply for the reconstruction grant many apartment associations in Estonia had not approved the decision to renovate the apartment building.

### **Suggestions for future financing/subsidizing schemes**

- Only full-scale renovation, giving 50% reduction of energy consumption, should be supported.
- The support share should depend on the capacity to invest from the saved energy costs.

### ***Project partner position***

- Energy saving in buildings is the main priority of the Estonian energy efficiency policy, since most of the country's building stock was constructed before any energy performance requirements were introduced. Both minimum energy performance standards and energy performance certificates are mandatory and should push energetic refurbishments.
- There has been significant progress in financial instruments (large soft loans and financial support programmes), but Estonia still suffers from a major financing problem. The funding for energy efficiency investments is still insufficient. **The reconstruction grant program as the most effective and motivational energy efficiency measure in blocks of flats should continue** to foster refurbishments.
- **The state should have a long- term strategy about the future of blocks of flats** and if needed, the policy package could be improved. It is highly positive that the discussions with state administration have been successfully started in 2013 and new development plans are in preparation.
- There is still a lack of awareness raising initiatives for members of housing associations to enable up-to-date renovations and expertise. **Estonia should improve education and training** in the field of energy efficiency in buildings, especially among members of housing associations in blocks of flats.

**Update December 2014:**

- An analysis of the condition of the housing stock and the effect of the reconstruction grants, conducted by KredEx, showed that with the help of reconstruction grants, apartment associations have invested a total of EUR 151.4 million into the renovation of apartment buildings. Investments made into apartment buildings are large-scale and dependent on state grants for the reconstruction projects.
- KredEx has helped to renovate 663 apartment buildings with a total closed net area of 1.9 million square metres, which is 9.7% of the total heated area of all the apartment buildings erected in Estonia before 1991.
- The energy efficiency support programme for the reconstruction of apartment buildings will continue. In 2014-2020, approximately 102 million euro of the funds of the European Union Structural Funds will be invested on achieving the desired energy performance outcomes in apartment houses.
- New regulation of the Minister of Economic Affairs and Communications on reconstruction grants will be approved in 2015 spring and it will establish new grant terms for next years.

✓ **Italy**

In July 2013, Finabita has contacted some of the major Italian experts in the field of energy efficiency and Housing managers and asked them to deal with the theme of financing/subsidising both for energy retrofit and RES systems.

The interviews were made by mean of telephone, in order to discuss the main critical/positive points of interest.

**Input from the experts**

**Financing/subsidizing schemes for energy efficiency and RES**

According to all the experts, the most successful financing scheme for energy efficiency is the **55% (recently upgraded to 65%) tax deduction for building energy retrofit**. This scheme, as explained in the Report of the Workshop „How to finance energy efficiency –

focus on Divided/Cooperative ownership“, allows to deduct the 65% of the total costs of the retrofit, according to some energy standards.

The main key points for success are:

- the relatively “simple” access to the financing;
- the financing is generous since the 65% of the intervention cost could be deducted;

- it allows money saving through the tax deduction.

Nevertheless the success of the scheme, something was missing:

- does not take in account people who do not have sufficient income for the initial investment;
- no certainty about the replicability of the incentive;
- no final quality check on the funded interventions;
- the scheme privileges retrofit interventions on single dwelling instead of the whole multi-family building: the result is a large number of interventions but very fragmented;
- the funded products/technology increased their prices, as no control being on them.

There are other financing schemes which have not been successful until now, in particular the “**Energy Efficiency Certificates**” scheme. This unsuccess is due to:

- the presence of more interesting incentives about energy retrofit, as the above mentioned 65% tax deduction;
- little appropriateness of the scheme to residential sector requirements, since originally it was developed mainly for industry sector;
- a minimum level of energy saving certificates is required to access to the Energy Efficiency Certificate market, which is quite difficult to achieve through energy retrofit initiatives in residential sector;
- the intermediation of an ESCo is required to access to the Energy Efficiency Certificate market.

Referring to RES, the most successful financing scheme is the **Feed-in Scheme** which grants incentives for electricity generated by photovoltaic plants connected to the grid. The success of this scheme is due to different reasons:

- the **feed-in tariff scheme** is based on the electricity produced;
- the tariff differs depending on the capacity and type of plant and is granted over a **period of 20 years**;
- it allows the distributed generation of electric energy;
- it is useful in case of deep renovation of the roof, especially in case of removal of an asbestos roof.

Nevertheless the success of the scheme, something is missing and/or should be amendable:

- the feed-in tariff was probably too generous and it does not allow a gradual and persistent development of the PV market in Italy;
- in the past edition, the feed-in-tariff did not favoured the energy self-production;

- in the past edition, the feed-in-tariff did not privilege enough (as should be done), small PV systems installed on residential buildings compared to large PV systems;
- the feed-in tariff scheme probably weighed too much on electricity bills because the tariff component that finances has increased a lot, especially on large users.

There are other financing schemes which have not been successful until now, in particular for PV systems, the funding program “10000 tetti fotovoltaici”. The funding criterion was based only on the system cost, not on system efficiency (energy production).

### **Suggestions for future financing/subsidizing schemes**

Finabita asked the experts to make some suggestions for future financing/subsidizing schemes, considering that the multi-family buildings (both in divided and cooperative property) are our main focus of interest.

Referring to energy efficiency, there are the following suggestions:

- the Energy Efficiency Certificates scheme could be improved through an “ad hoc” regulation, especially for residential sector. In November 2011, the scheme has been already improved, reducing the minimum level of energy savings required to access to the market;
- a specific financing scheme for multi-family houses could be inspired to the UK “Green Deal” scheme;
- new funding schemes should be addressed mainly to those interventions (both new and refurbished) whose energy requirements are higher than the standards ones;
- national funding schemes should be supplemented by local tax deduction, such as statutory approvals costs or IMU (*Imposta Municipale Unica*, council tax on existing buildings) tax. For instance, IMU tax should be related to building energy performance;
- more certainty of the financing schemes in the middle term (at least 10/15 years) is required, in order to properly plan investments;
- more attention to the buildings’ deep renovation interventions instead of fragmented actions.

Referring to RES systems financing/subsidizing schemes, there are the following suggestions:

- PV systems do not require further financing schemes, since the price for components has been decreasing during the last years. Anyhow, more attention should be directed to the regulation of the PV systems operations in order to maximize the self-production also for centralized systems installed on multi-family buildings, allowing the delivery of the surplus produced energy to the single dwellings. As far as now, in Italy the delivery from centralized to single dwellings is not legal;

- The SEU (*sistemi efficienti di utenze*<sup>1</sup>) scheme applicable also to the residential sector should be foreseen. Such a scheme could improve the affordability of the PV system investment also in case of absence of the feed-in-tariff;
- There should be more attention to solar thermal and CHP systems also on multi-family buildings.

### ***Input from housing managers***

## **Financing/subsidizing on energy efficiency and RES: state of the use and some practical highlights**

Finabita asked to Housing managers to describe the real state of the use in case of both divided and cooperative property.

Referring to the use of financing/ subsidizing schemes for energy efficiency, there are the following highlights:

- some housing Companies located in region Piedmont used a funding program for energy efficiency in social housing established by the Regional Government. The new buildings should reach a minimum score (2.5) of the environmental sustainability protocol named ITACA<sup>2</sup>;
- some housing Companies are now using of Energy Efficiency Certificates scheme on their own cooperative property;
- some housing Companies have used 55% tax deduction on divided property;
- only very few Companies try to use 55% tax deduction on cooperative property, especially on communal spaces/systems (e.g. heating systems, insulation of walls).

All the housing managers agreed that the financing schemes were quite simple to access to.

Nevertheless, they pointed out some critical point, the main one is that the use of the 55% tax deduction scheme is only for refurbished buildings and not for the new ones.

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<sup>1</sup> A SEU scheme is a network of users composed by a maximum of two subjects: an electricity producer from RES and the final customer. It allows the producer to sell energy from RES behind the counter, without having to pass through the network.

<sup>2</sup> ITACA (Istituto per l'Innovazione e Trasparenza negli Appalti e la Compatibilità Ambientale) Born in 1996, on the initiative of the Italian regions, the Institute is an association with aim to trigger actions and initiatives shared by regional system. Since 2005, as a result of the role played by Ithaca and was recognized by the Regions and by national reference, with which it interacts, adopted its new name, "Institute for Innovation and transparency in government procurement and environmental compatibility" , which, while confirming the identity of Association, it also underscores the commitment on the side of the issues related to environmental sustainability.

Another critical point consist in the legal interpretation by the National Tax Agency, which considers not eligible for financing the energy retrofit on cooperative property: even if the interpretation has not the legal cogency, nevertheless it acted like a barrier and discouraged a great part of housing Companies in using it.

Therefore, we could say that at the moment, there is a lack, at a National level, of clear and specific schemes for financing energy retrofit on multi-family cooperative buildings, except for White certificates in the last months.

Referring to RES systems financing, the most used was the Feed-In tariff, which provides benefits and was quite simple to access.

### **Suggestions for future financing/subsidizing schemes**

Finabita asked the housing managers to make some suggestions for future financing/subsidizing schemes, considering that the multi-family buildings (both in divided and cooperative property) are our main focus of interest.

These are some highlights:

- a deep renovation of the building should involve in the process also the ESCos and heating management companies;
- more involvement of the households should be foreseen also in multi-family houses: this is a crucial point, in order to obtain real energy savings;
- more “physical” interface instead of web portal for the financing request;
- more involvement of the banks for the initial capital investment.

### ***Project partner position***

- According to statistical data, in Italy about 24 million people live in multi-family buildings where the energy consumption is higher than the national average, especially if the buildings were built after the Fifties. According to estimates from ISTAT<sup>3</sup> and Cresme<sup>4</sup>, multi-family buildings with more than five units are more than one million. Unfortunately for those who live there, there is little hope to reduce energy bills, since the existing energy efficiency practices are ineffective and often impossible to be applied.
- New financing tools are needed to develop a virtuous cycle, together with a Guarantee Fund for the credit given to the enterprises. New incentive scheme for energy retrofit should be

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<sup>3</sup> Italian National Institute of Statistics

<sup>4</sup> Sociological and Economic research center



proposed focused on multi-family buildings. One of the models to look at is that one of the **Green Deal** introduced in the United Kingdom, which allows **actions at no cost for families; such actions can be paid back with the savings made in energy consumption**. ESCO and construction companies can easily develop these projects in Italy: this scenario could also provide a way out from the crisis in the building sector.

- **Tax deductions for buildings renovations and energy retrofit** incentivised the renovation of more than 5,5 million houses from 1998; however the improvement was not connected to the achievement of any specific energy target or specific intervention on the buildings. Deductions up to 55% were introduced in 2007 to improve energy efficiency in the building sector, where more than 1.6 million interventions were recorded: replacement of windows, heating systems, solar panels, heat pumps.

Furthermore, tax deductions incentives are not real savings but are calculated as a tax deduction; this leads to difficulties for many families, particularly in a period of recession in case of lack of the initial economic capital.

- The last system introduced, the so called **“thermal energy account”**, financed through the gas bills, provided incentives for energy efficiency measures for external parts of public buildings only.
- The Energy Efficiency Certificates market is becoming of interest: the Energy and Innovation branch of Legacoop organized a meeting with GSE (in charge of the mechanism) in order to open a dialogue and consequently to ask more profitable aggregation.
- The system of Energy Performance Certificates (EPC), based on the values resulting from the energy certification of buildings before and after the intervention, should be relaunched.

### Some proposals for the future

- Legambiente (Italian League for Environment) made a proposal about the retrofit of residential housing complexes with a minimum of 5 houses through the use **of energy efficiency certificates** and ESCO, with the consequent reduction of fifty per cent of energy consumption. The proposal is very concrete and foresees that incentive would include the possibility to connect the cost of the intervention to the residential utility provision contracts, effectively financing the improvement cost via the utility contracts. Tenants should benefit immediately of a bill reduction and more comfort in summer and winter.
- Legacoop has promoted an amendment whose aim is to ask for changes to the DL 63/2013 in such a way that social housing Companies are clearly included among the beneficiaries, allowing the use of 65% tax deductions for energy retrofit intervention on cooperative property buildings.

### Update December 2014:

In July 2014, Italy has approved the transposition of EED 2012/27 through the Legislative Decree (n. 102/2014). At the same time, ENEA (the Italian National Agency for New Technologies, Energy and Sustainable Economic Development) presented the National Action Plan for Energy Efficiency 2014. The document shows the energy efficiency targets set by Italy in 2020 and the policy measures to enable their achievement. In this document, particular attention is devoted to the description of the new measures introduced by Legislative Decree 102/2014.

According to Finabita, some articles are very interesting and could represent a start for the roadmap to NZEB, in particular article 15, which introduces the National Fund for Energy Efficiency. The Fund is designed to promote the financing of interventions consistent with the achievement of the national targets for energy efficiency, promoting the involvement of financial institutions, national and community and private investors on the basis of an appropriate risk-sharing, with particular regard to the following purposes:

- a) measures to improve energy efficiency in buildings owned by public authorities;
- b) the development of district heating networks and the cooling;
- c) energy efficiency of public services and facilities, including public lighting;
- d) energy efficiency of entire buildings to residential use, including social housing;**
- e) energy efficiency and reduction of energy consumption in the industrial and service sectors

The Fund will receive some **€70 million per year for the period 2014-2020**, which will be integrated with any voluntary contribution of MAs, with resources from the European Structural Funds. The Fund should be approved by the end of 2014.

In November 2014, Italy has approved a Law, n. 164/2014 named "Sblocca Italia". In article 22, the Law establishes that SH companies could access to financing mechanism for energy renovation of building named "Conto Termico" . It finances the following measures:

- a) thermal insulation of opaque surfaces delimiting heated space (external walls, ceilings);
- b) replacement of windows;
- c) replacement of existing heating systems generators with generators utilizing condensing heat;
- d) replacement of existing heating systems generators with heat pumps;
- e) installation of solar thermal collectors, also combined in solar cooling systems;
- f) replacement of electric water heaters with heat pump water heaters

Until now, SH companies could only access to the measure "E" (installation of solar thermal collectors), all the other measures were reserved only to Public Administration buildings.

Despite these hopefully good news, Finabita argues that some questions remains still open, in particular:

- incentives are still not related to energy performances after renovation. Both for private than for public interventions, access to incentive tools must always be tied to an energy audit that shows the results to be achieved (in terms of change of Energy Class) and a subsequent verification of the achieved results. The direction to take is to encourage interventions capable of achieving a reduction of at least 50% of energy consumption;
- to promote the energy renovation of whole multi-family buildings. Interventions on multi-family buildings must become simple and advantageous to be realized. A regulatory intervention that simplifies the energy renovation is needed, and should be related to the improvement of the energy performance of whole buildings after intervention. An incentive for the renovation of multi-family buildings is needed, but should overcome the barriers of access for low-income families.

### **Workshop 20.11.2014:**

In November 2013, Finabita organized a Workshop titled” **New investments: opportunities in European programming 2014-2020 - Drawing innovation: energy challenges, the new urban agenda, Smart Cities**”.

The Workshop aimed to investigate new financing channels, in the perspective opened by the new 2014-2020 programming at EU levels. The focus was the financing of “**nearly zero**” **buildings and smart cities**, giving a look to the most interesting and advanced cases in the international arena and, in the same time, taking into consideration the critical factors when developing such projects, from the point of view of social housing companies. The seminar was addressed primarily at figures that within the cooperative are involved in design -innovation - technical office.

The workshop was structured in two sessions:

- a first one to get an overview of the various categories of European Funds;
- a second phase to analyse the situation at the national level, to present successful projects, to share experiences, ideas and thoughts, even by co-operators.

### **Speakers:**

- *Stefan Moritz –EU Funds Expert*
- *Julien Dijol - Policy Coordinator Cecodhas Housing Europe*
- *Managing Authorities: Nadia Galluzzo (Liguria Ricerche) and Alice Tura (Lombardia Region, D.G. Environment)*
- *Urban Agenda and Smart Cities: Elisa Filippi (National Observatory Smart City – Cittalia) and Bruno Villavecchia – AMAT (Agency for Environment and mobility Milan)*
- *Best Practices of projects and partnership:*
  - *RES Coop 20-20-20 (Matteo Zulianello – Avanzi)*

- Padova Fit (*Michele Zuin-Municipality of Padova*)
- R2Cities (*Daniele Pozzo - D'Appolonia*)

**Main outcomes:**

- Overview of the different EU funds available for the period 2014-2020 and identification of the main themes of interests for SH companies:
  - **ERDF** : At least 20% of the total ERDF resources at national level should be allocated to one or more low carbon priorities (ERDF regulation article 4):
    - Renewable energies
    - Energy efficiency in enterprises
    - Energy efficiency in housing
    - Smart distribution grids
    - Sustainable urban mobility

At least 5% of the ERDF resources allocated at national level shall be allocated to integrated actions for sustainable urban development where cities, sub-regional or local bodies responsible for implementing sustainable urban strategies shall be responsible for the management of local programmes.
  - **HORIZON 2020**: analysis of the most suitable calls for SH companies :
    - Pillar 3 “Societal Challenge”, Call “*Health, Demographic Change and Wellbeing*”
    - Pillar 3 “Societal Challenge”, Call “*Secure, Clean and Efficient Energy*”:
      - Energy Efficiency
      - Smart Cities and Communities
  - **Life + program** : resilience to Climate Change
  - **Urbact III**
- Strategy for SH companies to put in place “Lighthouse projects”. Identify financial instruments mixing different funding possibilities:
  - R&D through H2020
  - Best practices exchange through URBACT or INTERREG
  - Smart Cities and Sustainable Urban Development through LIFE+ and ERDF
  - Involvement of Banks, including EIB.
- **ERDF: opportunities for 2014-2020**

- Set up a **regional fund** made of ERDF contributions, regional public support (regional or national public banks), private investors: propose loans or guarantees for social housing organisations to make investments in Energy efficiency and Renewable Energy; support of the development of Energy performance contracting; grants should also be available in particular for energy auditing, project preparation.
  - Set up a wider integrated strategy for territorial development using the new instrument “**Integrated Territorial Investment**” (ITI).
  - In the energy efficiency sector, the option of creating value for energy savings through market mechanisms (energy saving obligations, energy service companies, energy performance contracting, etc.) should be considered before public funding or used to leverage additional private capital.
- **Best practices of projects and partnership**
- **RES Coop 20-20-20:** the goal of REScoop 20-20-20 is to promote the renewable energy sources cooperatives model of local citizen involvement in RES energy.-  
<http://www.rescoop.eu/it>
  - **Padova Fit!**: Padova Municipality promotes actions to improve energy efficiency in private multi-family buildings in the territory, in particular through:
    - changing the building code so as to provide sustainability criteria in new buildings
    - information on the tax benefits
    - increase awareness in the use of energy
    - the promotion of good practices
    - energy renovation of about 200 condominium buildingsSee <http://www.padovafit.it/>
  - **R2Cities:** The purpose of the R2CITIES project is to develop and demonstrate replicable strategies for designing, constructing and managing large scale district renovation projects for achieving nearly zero energy cities  
See <http://r2cities.eu/>

The Workshop presentations/proceedings find [here](#).

### 3 Part B Renewable Energy Systems

Usage of Renewable Energy System is essential for nZEB. In different countries there are significantly different experiences concerning the integration of RES, especially solar and geothermal energy, into residential buildings. Being a relatively new phenomenon, local legislation is currently under a quick development and adaptation in Member states. Use the [Hive web portal](#) to follow the production performances of RES installed in project case studies.

#### Experiences from case studies

In the following paragraphs, there will be presented how RES technology has been implemented in practice in the case studies selected. For each case study, information will cover the following aspects:

- how the technology is working in the case study;
- why the technology was selected for that project in particular;
- what kind of maintenance is required;
- suitability of the technology for multifamily buildings;
- what should be kept in mind when adopting the RES technology in divided or cooperative ownership projects.

#### ✓ Bulgaria

##### Energy renovation of existing condominium apartment building – Zaharna Fabrika estate bl. 11 – Sofia

- The case study refers to an energy retrofitting of a multi-family condominium building located in Sofia;
- The building is a multi-storey apartment type (condominium), no formal association of apartment owners was established;
- The project was carried out because of the high price for heating and the uncomfortable indoor climate. The building is with individual heating provided by electrical appliances. The hot water is provided by electrical boilers.

#### Selected technology:

The project includes complete refurbishment of the building envelope – thermal insulation of the external walls, the roof, the ground slab and replacement of the window frames with PVC double glazing. The project also includes renovation of the common areas – staircases, building installations, etc.

The technical design of the energy efficient renovation of the condominium building includes installation of solar collectors supplied with:

- water boilers,
- heat exchanger,
- expanding vessel,
- circulation pumps,
- hydro-module for automatic management of temperature sensors.

The technical design of solar thermal installation is coordinated with the utility provider for heating and hot water at district level.

### **Maintenance required:**

- Solar thermal installation technology requires some maintenance service

### **Energy renovation of existing condominium apartment building – Madrid 11 – Sofia**

- The case study refers to an energy retrofitting of a multi-family condominium building located in Sofia;
- The building is of a multi-storey apartment type (condominium), no formal association of apartment owners was established;
- The project was carried out because of the high price for heating and the uncomfortable indoor climate.

### **Selected technology:**

The project includes complete refurbishment of the building envelope – thermal insulation of the external walls, the roof, the ground slab and replacement of the window frames with PVC double glazing. The project also includes renovation of the common areas – staircases, building installations, etc.

The technical design of the energy efficient renovation of the condominium building includes installation of solar collectors supplied with:

- water boilers,
- heat exchanger,
- expanding vessel,

- circulation pumps,
- hydro-module for automatic management of temperature sensors.

The technical design of solar thermal installation is coordinated with the utility provider for heating and hot water at district level.

### Maintenance required:

- Solar thermal installation technology requires some maintenance service.

✓ **Estonia**

### Energy refurbishment of 18 dwellings in Rõõmu str 12, Tartu

- The case study refers to an energy retrofitting of a multi-family building located in Tartu;
- the building is a divided ownership type, operated as association;
- the technology was selected on the flat owners meeting.

### Selected technology:

- The heat recovery technology *Intelivent inverter heat recovery system* is in use and first feedback is that problems with mould and moisture are solved now, fresh pre-heated inlet air is available for all apartments.
- Two pipe heating system with thermostatic valves on each radiator allows to regulate comfortable temperature in each room.
- Apartments are warmer now and there is not unbalance anymore in the heating system.

### Energy refurbishment of 30 dwellings in Õismäe str 11, Tallinn

- The case study refers to an energy retrofitting of a multi-family building located in Tallinn;
- the building is a divided ownership type, operated as association;
- there was interest to reduce the energy cost and get the 30-year-old apartment building fully renovated.

### Selected technology:

- The solar panels for production of hot water were installed recently;



- heat recovery from exhaust air was installed recently;
- the technology is suitable for multi-family buildings;
- the technology is suitable both: for divided or coop ownership, only the common hot tap water system must be in use in the building to allow produce common hot tap water with solar panels.

### **Maintenance required:**

- filter maintenance for ventilation
- Cleaning and liquid level testing for solar panels

### **Energy refurbishment of 32 dwellings in Tartu str 33, Võru**

- The case study refers to an energy retrofitting of a multi-family building located in Võru;
- the building is a divided ownership type, operated as association;
- the technology was selected on the flat owners meeting.

### **Selected technology:**

- The heat recovery technology *Intelivent inverter heat recovery system* is in use and first assessment of the first full year shows that these people who are using the system are satisfied with it as there is fresh air now in the apartment and no mould and moisture anymore.
- Without the use of radiators the heat recovery system does not provide preheated inlet air and this may cause problems (cold fresh air inlet).
- Two pipe heating system with thermostatic valves on each radiator allows to regulate comfortable temperature in each room. Apartments are warmer and there is no unbalance in the heating system.

### **Energy refurbishment of 40 dwellings in Võidu str 42, Rakvere**

- The case study refers to an energy retrofitting of a multi-family building located in Rakvere;
- the building is a divided ownership type, operated as association;
- the technology was selected on the flat owners meeting.

### **Selected technology:**

- The heat pump technology for heat recovery and hot tap water production from heat from recovered ventilation;

- The technology is suitable only for multi-family buildings, because the capacity of exhaust air should be large enough for the heat pump;
- That technology is suitable both for divided and coop ownership, because the ventilation systems and hot tap water systems are common systems for buildings with different ownership;
- When adopting the RES technology like heat pumps, the common electricity consumption may rise ten or even more times.

### **Maintenance required:**

- Heat pump technology requires some maintenance service.

### **Energy refurbishment of 60 dwellings in Tuleviku str 10, Rakvere**

- The case study refers to an energy retrofitting of a multi-family building located in Rakvere;
- the building is a divided ownership type, operated as association;
- the technology was selected on the flat owners meeting.

### **Selected technology:**

- The heat recovery technology *Intelivent inverter heat recovery system* is in use and first assessment of the first full year shows that people are satisfied with the system as there is fresh air now in the apartment and no mould and moisture anymore.
- Two pipe heating system with thermostatic valves on each radiator allows to regulate comfortable temperature in each room.
- Apartments are warmer now and there is no unbalance anymore in the heating system.

✓ **Italy**

### **New construction of 142 dwellings in Bazzana Inferiore, Assago (MI)**

### **Main points of interest about the project**

- the building belongs to cooperative ownership;
- space and water heating is done by means of geothermal heat pumps, which during the summer also provide for space cooling;
- the heat pumps are water / water, using as cold source the superficial underground water. Since the heat in the cold source is due to the underground water, the low enthalpy

geothermal energy deriving is classified as a renewable energy source, that is the reason why we deal here with this case study.

- A 20 kWp PV system has been installed, the modules being positioned on the tilt roof. Part of the energy is used for the heat pumps; part is released into the grid. The system benefits of a feed/in tariff.

### Lessons learned

This building has not been occupied yet at the time of writing this document, but more information will be available with the second version.

The housing company already manages PV systems. Below, there is a list of lesson learned they kept in mind when designing this new solar thermal system.

- The heat pumps are installed in order to obtain an high-energy efficient building, that means to reduce not only heating consumption but also cooling ones;
- Maintenance is a critical point, especially referring to the production of hot water. The start-up of the system should be done in synergy between the designer and the maintainer, in order to have a clear and complete transmission of the more relevant and likely critical issues regarding system malfunctioning;
- It is suitable both for divided and cooperative ownership;
- End users (households) should be informed about the indoor correct use of this kind of system, because if the use is not appropriate, the building will have higher energy consumption and households will not have indoor comfort.

### Updates December 2014

Finabita has contacted the technicians responsible of the project in December 2014 and asked them some updates regarding especially the lessons learned:

- The dwellings started to be occupied in November/December 2013. The SH company is not yet able to quantify the potential savings of this building comparing to a traditional building, since the first year of operation has not been completed yet. In addition, the energy supplier does not read the meters regularly, hence the bills received by the SH company are not in line with the actual production. However, the building consumption is monitored and put in Hive.
- As for the operation and management of the Heating system (heating pumps and other devices), the SH company states that it has been necessary a transitional period in which they are sought initial optimal adjustments of the various technical components and different settings with respect to those carried out by the installer, especially concerning the dehumidifiers. Even the calibration of the flow temperature was carried out manually and weekly by the technician in order to obtain an optimum performance. In this type of system a transitional period of settling should be

provided in order to obtain good yields: we must consider that this transitional could cause discomfort to the inhabitants (eg, lack of heating and / or DHW), who therefore should be informed about it and about any kind of possible malfunctioning deriving from it.

- In addition this typology of heating systems is rather complex and their management / maintenance is often tied to the manufacturing company. This can be a problem especially in the case of system shutdown, because the repair could not be timely, thus causing inconvenience to the households.
- The heating pumps produce both heating and cooling. Households should be informed about the fact that the radiant cooling produces a cool feeling different from that produced by traditional split: there is not a flow of cold air coming out of the vents, but radiant system creates a cool feeling widespread, much more comfortable but also less direct. Since the service can be set on per apartment, the SH company stressed the importance to the inhabitants of closing the service when the apartment is unoccupied in order to avoid energy waste.
- Despite all the difficulties in the transitional period due to the technical adjustments, residents are satisfied especially for the comfort.

### *Energy refurbishment of 131 dwellings and new construction of 45 dwellings Via Caldera 109, 20153 Milano*

#### **Main points of interest about the project**

- the building belongs to cooperative ownership;
- the project consists in both renovation and new construction of buildings;
- the domestic hot water system will be centralized, the energy provided by the condensation boiler (natural gas) and by a solar thermal system. They will be implemented in the next weeks.

#### **Lessons learned**

The housing company already manages solar thermal systems. Below, there is a list of lesson learned they kept in mind when designing this new solar thermal systems.

- The housing company decides to install two separated hot water storage boilers instead of only one (as they did in other buildings) in order to maximize the solar apport. In fact, from their experience, they recognize that householders mainly use the hot water when there is no solar contribution (in early morning or in the evening). Consequently the water is heated mainly by the condensation boiler and not by the solar one. Two separated boilers with a regulations system allow to use first the hot water deriving from the „solar“ storage and then the other one.

- Referring to solar thermal systems in multi-family centralized systems, it is very important to have a heat generator which is dedicated to hot water production, in order to reduce maintenance cost during summer, when heating systems are switched off.
- Maintenance cost is a crucial point: costs are acceptable, but the energy performance of the system should be carefully monitored, in order to promptly verify the plant settings.
- It should also be expected to carry out adequate insurance coverage, because hail and other weather events can cause serious damage to solar collectors that are quite vulnerable.

More details about the usability of the solar thermal system will be available in the next months, when the system will be working at 100%.

### Updates December 2014

- The building consumption has been monitored by web panel HIVE. The comparison between winter 2012/2013 and winter 2013/2014 shows that there are very significant savings of about 36%. Savings have been corrected on the basis of the degree-days recorded last winter season, since it was milder than the previous one (-13.9%). Despite the normalization, heating savings are around 27%. This result is due to the replacement of all windows, which occurred during 2013. The SH company expects a further improvement after the renovation of condensation boiler and the installation of thermostatic valves and energy meters in every flat.
- The works of roof insulation, new armored doors and new gas centralized boiler have been just ended in September 2014 and the savings for the current winter will be measured in the coming months.

### **New construction of 16 dwellings in Via Martiri Palestinesi, Cinisello Balsamo**

#### **Main points of interest about the project:**

- The building belongs to cooperative ownership and it is a multi-family type;
- the cooperative company was obliged to install the PV system in accordance with the Lombardy Regional Government energy standards for new buildings;
- the building is under construction, there will be solar PV on the roof.

#### **Lesson learned**

The housing company already manages several PV systems. Below, there is a list of lessons learned they kept in mind when designing these new PV systems.

- pay attention to the PV modules orientation in order to maximize energy production;
- monitor the PV energy production, in order to act promptly in case of breakdown and/or malfunctioning;
- PV system generally requires little maintenance, which must be promptly in order to avoid lack of production or bad energy performance;

- PV technology is suitable both for divided and cooperative ownership buildings.

### **Suggestions for future:**

Since Feed-in tariff incentives are going to finance self- consumption instead of energy production, the design of PV systems should be done considering this aspect. Normally, PV systems installed in multi-family houses serve communal spaces, which are characterized by a consumption cycle which is opposite to the PV energy production one. Hence, energy storages should be foreseen in the system, in order to stock energy during the day and deliver it when necessary.

More details about the usability of the PV system will be available in the next months, when the system will be installed.

### **Updates December 2014:**

The building is now in construction phase. Construction works started in August 2014 and will end in March 2015. In October 2014, Finabita staff has participated to a visit to the building site: the structure was completed and technological systems were going to be installed. There will probably be a new site visit in January 2015.

### **New construction of 18 dwellings in Via Fenil Novo Molini, Brescia**

#### **Main points of interest about the project:**

- the case study refers to two buildings that belong to cooperative ownership: they are a multi-family type;
- each of the 2 buildings is equipped by 20 kWp PV systems;
- The PV systems are funded by the 2<sup>nd</sup> Feed-in Tariff scheme.

#### **Lessons learned**

The housing company already manages several PV systems. Below, there is a list of lesson learned they kept in mind when designing this new PV systems,

- attention in the PV modules orientation/tilt in order to maximize energy production;
- monitoring the PV energy production, in order to act promptly in case of breakdown and/or malfunctioning;
- PV systems on multi-family buildings are characterized by little maintenance, and generally this is due mainly to weathering (lightning and power surges resulting).

#### **Suggestions for the future**

Since Feed-in tariff incentives are going to finance self- consumption instead of energy production, the sizing of PV systems should be done considering this aspect. It could be useful to deliver the

energy produced by the PV modules not only to common spaces uses (e.g. lighting, lift) but also to all the flats, in order to maximize the self-consumption by all the families. This should be achieved both by divided and cooperative property.

### The situation in the 3 Countries

#### ✓ **Bulgaria**

CAC contacted Bulgarian experts in the field of energy efficiency and active homeowners in order to discuss the main identified issues regarding the use of RES technology in condominiums. The interviews with experts and homeowners were conducted by e-mail and phone.

#### ***Input from the experts***

#### **Focus on RES systems: technology in condominium buildings**

CAC interviewed the experts the most appropriate and applicable RES for condominium buildings in Bulgaria. There are several options technically available for such buildings:

- PV systems
- solar thermal systems
- heat pumps for heating and cooling
- biomass CHP

In terms of feasibility/payback period:

- PV systems are quite simple to manage, but there are obstacles for application in condominium buildings – high initial costs, lack of specific regulation feed in tariff for residential sector;
- Solar thermal systems represent a good combination with low initial costs and simple operation; their size should be in correlation with the real energy requirements of the buildings;
- heat pumps technology were not considered eligible because of high initial costs
- biomass CHP are problematic due to high initial costs and availability of biomass in big cities.

### ***Input from housing managers***

#### **Focus on RES systems: utilization in condominium buildings**

CAC asked the homeowners from the limited number of pilot buildings with installed RES about their experiences about the management of solar thermal collectors.

- Since the systems are in operation for a very short time, it is too early to make concrete conclusions, the technology is not well known
- The tailor made design of the system is important to avoid overheating of water for solar thermal technology in summer time
- RES application should be made in combination of “conventional” energy efficiency measures – insulation of “building envelope”
- The maintenance of solar thermals by homeowners needs additional training that is still missing point

#### ***Project partner position***

- There is still no officially adopted definition for a NZEB in Bulgaria.
- Collection of information and organisation of analyses is required for preparing forecasts for the use of renewable energy in buildings.
- Further development of national building legislation is needed to establish the minimum level of energy use from renewable energy sources including the case of condominium buildings.
- District heating in Bulgaria with a high share of renewable energy may be an important point for the heating strategy in Bulgaria and work well in the context of nZEB implementation for condominiums.

There are thresholds suggested by BPIE for an nZEB definition in Bulgaria (2012). They are fairly ambitious yet affordable when compared to the actual practice. However, these thresholds are significantly less ambitious than in other Western Europe countries which aim to reach climate neutral, fossil fuel free or even energy positive new buildings<sup>5</sup> by 2020.

Therefore, the proposed by BPIE nZEB definition should still be gradually improved after 2020 and it is likely to lead by 2030 to energy and climate neutral levels. Beyond implementing an EU Directive requirement, the significant reduction in energy consumption and related CO<sub>2</sub> emissions of the

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<sup>5</sup> For more details on other EU countries strategies for implementing nZEB by 2020, please see table 3 from BPIE (2011). Principles for nearly zero-energy buildings - Paving the way for effective implementation of policy requirements. Available at [www.bpie.eu](http://www.bpie.eu)



building sector will have a major impact on the Bulgarian energy supply security, by creating new activities and jobs and by contributing to a better quality of life for Bulgarian citizens.

✓ **Estonia**

In July 2013, EKYL contacted some of the Estonian experts in the field of energy efficiency and managers of apartment associations to discuss the main identified issues regarding the use of RES technology in divided property. The interviews with experts were made by e-mail and additional questions and points of interest were discussed by phone when needed. The interviews with managers were made by phone.

***Input from the experts***

**Focus on RES systems: technology in multi-family residential buildings**

EKYL asked the experts which is the best technology of RES in Estonia for multi-apartment buildings today.

- All experts mentioned efficient heat recovery ventilation as the best technology of RES in Estonia.
- The solar panels for hot tap water based on summer consumption were also considered an important technology in Estonia.

Some highlights and recommendations:

- Heat recovery in ventilation systems is important because it creates healthy indoor climate after renovation. The buildings of soviet time did not have proper ventilation, so this will have effect in many buildings if implemented.
- For renovation local ventilation systems should be used while for new build the centralized ventilation should be preferred.
- In order to avoid problems, specific training of project managers and building inspectors must be provided.
- Awareness of consumption is the key for using any technology.
- Together with the change of technology, for apartment associations is important to get the votes for the decision in general assembly. So the preparation work and discussions with apartment owners are very important.

### ***Input from the managers of apartment associations***

#### **Focus on RES systems: utilization in multi-family residential buildings**

EKYL asked the managers of apartment associations to share their experiences about the management of RES systems.

- All the managers who answered the questionnaire had already installed heat pump for exhaust air heat recovery or solar thermal technology or both.
- As the renovation and installation of new RES system have been done recently, the technology is not well known, so there is not much previous information about the installations of these new RES systems in Estonia.
- The design is important to avoid overcapacity for solar thermal technology and also for heat pump in summer time.
- It is useful if the renovation is made in full-scale (insulation, heat regulators and heat recovery ventilation included).
- All the managers who answered would use the used technologies again.

#### ***Project partner position***

- According to Estonian legislation, the NZEB is defined as a technically reasonably achievable level, considering the current best practices and the on-site energy production by RES (the share of energy by RES is not fixed). Therefore, the measures should be introduced to increase the use of RES in multi-apartment buildings together with demonstration and awareness rising.
- Collection of information and organisation of analyses is required for preparing forecasts for the use of renewable energy in buildings.
- Development of national building legislation and rules is needed to establish the minimum level of energy use from renewable energy sources in the case of new and existing public sector buildings that undergo large-scale renovation.

#### ***Updates December 2014:***

The new Estonian National Development Plan of the Energy Sector Until 2030 drafts the benchmarks for renewable energy and energy efficiency operational programmes and the vision for the renovation of buildings. The development plan was submitted to the Government for approval at the end of 2014.

#### **✓ Italy**

In July 2013, Finabita has contacted some of the major Italian experts in the field of energy efficiency and Housing managers. The interviews were made by mean of telephone, in order to discuss the main identified issues regarding the use of RES technology both in divided and cooperative property.

### ***Input from the experts***

#### **Focus on RES systems: technology in multi-family residential buildings**

Finabita asked the experts to deal with the RES technology. In multi-family buildings the most interesting RES systems technology are:

- PV systems
- solar thermal systems
- heat pumps for heating and cooling
- biomass CHP

Some highlights and recommendations to bear in mind in order to avoid problem:

- PV systems are quite simple to manage, but there are some limits in the diffusion especially in multi-family houses, due to the lack of specific regulation about electricity self-producing in residential sector;
- PV and solar thermal systems should be monitored by the building occupants: the monitoring provides the real benefit - energy saving!
- Both PV and thermal systems' sizing should consider the real energy requirements of the buildings;
- heat pumps technology have good potential, but could be applicable only in cases of new buildings or in case of deep building renovation, that means including not only the heat generator but also the envelope and all the elements of the heating system;
- some application cases demonstrate that also a mix of RES system could be a good solution to meet the energy needs in multi-family houses (e.g.: PV system + heat pumps);
- the choice of the appropriate RES system must be made taking into account the characteristics of the territory (e.g.: the availability of biomass).

### ***Input from housing managers***

#### **Focus on RES systems: utilization in multi-family residential buildings**

Finabita asked the housing managers to share their experiences about the management of RES systems.

- the most part of the interviewed managers have already installed both solar and PV systems: in Italy, some Regional Governments established that new constructions must be equipped by solar thermal and/or PV systems (depending on the Region). So, the technology is well known;
- PV systems are frequently installed on the common parts of buildings, and they serve common spaces (e.g. lighting systems, the lift);

- Also underground water/geothermal heat pumps systems are used by cooperative companies, sometimes they are powered by PV systems.

They pointed out also some positive and/or negative aspects:

<i>Technology</i>	<i>Positive</i>	<i>Negative</i>
Photovoltaic	<ul style="list-style-type: none"> <li>▪ Quite easy to manage.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Lack of continuity of funding</li> <li>▪ In case of a multi-family building, no possibility to deliver the electricity produced by a centralized plant to the single dwellings</li> </ul>
Solar thermal	<ul style="list-style-type: none"> <li>▪ Even if the systems is centralized, the benefits deriving from the energy saving could be shared between all the dwellings</li> </ul>	<ul style="list-style-type: none"> <li>▪ Lack of continuity of funding</li> <li>▪ Maintenance required</li> </ul>
Underground water/Geothermal Heat pumps	<ul style="list-style-type: none"> <li>▪ Provide both heating and cooling, no other cooling systems are required.</li> </ul>	<ul style="list-style-type: none"> <li>▪ In case of ground water heat pump, some normative limitation for the permission of the water extraction</li> </ul>

Furthermore, they also give us some useful lessons learned and recommendations about how to avoid problems during the managing phase in multi-family houses:

- in case of PV/solar thermal systems, flat roof is a good point, in order to maximize the PV modules surface and obtain a good orientation, as well as greater safety for maintenance;
- in case of solar thermal system, maintenance and management are crucial points: the system installer should also be in charge of maintenance;
- maintenance cost is a crucial point: costs are acceptable, but the energy performance of the system should be carefully monitored, in order to promptly verify the plant settings;
- it should also be expected to carry out adequate insurance coverage, because hail and other weather events can cause serious damage to solar collectors that are quite vulnerable.

Finally, we asked them if RES systems are suitable both for new and refurbished multi-family buildings.

- Solar thermal system: this technology works well in case of hot water production, so it suits both new and refurbished buildings.

- Since as far as now, there is no possibility to deliver the electricity produced by a centralized plant to the single dwellings, PV systems are efficient when using heat pumps for heating and cooling, so in case of new building.
- PV systems could also be efficient in case of a deep building renovation, but only if the final energy performance of the building is quite high.

### ***Project partner position***

- RES systems are necessary in order to achieve the nearly zero energy performance.
- Technological systems in the nZEB are no longer isolated but become elements of a common energy system on a regional scale: this approach allows the use of technologies that give the excess energy to the grid (for example solar photovoltaic systems or cogeneration): centralized generation turns into distributed generation, which implies the availability of smart energy infrastructures (smart grid).
- In nZEB perspective, PV centralized systems are going to become a standard for new and refurbished buildings: but, to be efficient, especially in multi-family houses, they need the possibility to deliver the electricity produced by a centralized plant to the single dwellings, in order to maximize self consumption.
- The RES technology solution individuated should be adequate to the project contest.

### ***Updates December 2014:***

Heat pump systems are going to be very diffused as RES, since they assure good level of comfort for the residents and can use the electricity produced by centralized PV systems. There are some lessons learnt about the managing of such a system:

- a transitional period of settling should be foreseen in order to obtain good yields: we must consider that this transitional could cause discomfort to the households (eg. lack of heating and / or DHW), who therefore should be informed about it and about any possible deriving malfunctioning;
- this kind of heating systems is rather complex and their management / maintenance is often tied to the manufacturing company. This can be a problem especially in the case of system shutdown, because the repair could not be timely, thus causing inconvenience to the households.

## Conclusions

This document is an important piece of work for the divided and cooperative task force. Two themes of extreme importance for the construction and retrofitting of nZE multifamily Building have been thoroughly treated: financing, which is vital especially for retrofitting projects, and renewable energy applications, which according to the nZEB definition must be used in order to cover a significant part of the energy consumed in the buildings.

The work done is considerable: beside the typical desk research, the authors have been gathering information from national experts, housing managers, and case studies and have as well reported the position of their social and cooperative housing organization.

This document is partly based on the results of the workshop held in Milan in early summer 2013, of which is now available a detailed report prepared by project partner BSHF<sup>6</sup>. The report includes also a description of a study visit, which has been done in 2 cooperative developments the day after the workshop, which was attended by more than 30 cooperative housing operators. A video of this event has been recorded and is available here: [www.youtube.com/watch?v=4rIEXSku2XMA](http://www.youtube.com/watch?v=4rIEXSku2XMA).

In order to maximize the benefit of this work for local practitioners, an annex for each of the three partners in partner language has been done. The Annex provides an updated overview of the national schemes available in the Country (Bulgaria, Estonia and Italy) to finance and subsidize energy efficiency and RES in buildings. Of course, maximum attention has been given to multifamily buildings with divided and cooperative property.

Pretending to summarize in few words the results of this large work is far too ambitious. But here some relevant points gathered from the work done on financing schemes:

- **Simple.** In order to be successful, applying for finances must be easy, quick and inexpensive for the applicant. Complicate, time and resource consuming schemes don't (and won't) generate significant results.
- **Durable.** Retrofitting and construction projects for multifamily buildings typically require few years to be implemented (study, decision, realization). Since the access to the financing is a

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[http://www.powerhouseeurope.eu/nearly\\_zero\\_taskforces/nzeb\\_in\\_dividedcooperative\\_ownership/key\\_resources\\_and\\_outputs/](http://www.powerhouseeurope.eu/nearly_zero_taskforces/nzeb_in_dividedcooperative_ownership/key_resources_and_outputs/)

vital component of financial feasibility calculation, the conditions for applicants must be known from the beginning and remain the same for a sufficient number of years, 3 or 4 years at least.

- **Support to private investment.** In a multifamily building, especially if social housing or cooperative building, and especially where the financial crisis and unemployment are stronger, there will always be some or part of the occupants who can't effort the investment. Loans must be available to complete the subsidy part of the financing scheme, possibly all integrated in the same financial mechanism.
- **Adequate subsidy.** The percentage of investment costs subsidized must be reasonable considering the actions taken. More should be given when more important savings are achieved. Real achieved savings should be, when possible, verified on the field. Excessive subsidy can have negative effects, such as finishing the resources allocated to the scheme, or increase the price of energy efficiency products.
- **Clear condominium law.** In order to facilitate the decision making process for retrofitting, otherwise important decisions such as deep renovation process are unlikely to be taken.
- **Trust.** Schemes, and their providers, must be trustable for the applicants and, most important, for the occupants of the building. To gain this "trust", the financed actions must prove to be effective (achieve energy savings, increase comfort and property value), and the financial scheme application- approval- payment stages must prove to work smoothly and according to what was promised.

Between all the financing schemes described in this document, two seems to be more successful in terms of number of buildings retrofitted and investment mobilized. These two are: the Kredex Reconstruction scheme (Estonia) and the Taxes Deduction for Energy Retrofit scheme (Italy), although this second one has been used mainly for retrofit of detached houses and individual apartments.

From the research done on the Renewable Energy Systems (RES) in divided and cooperative property buildings, the main points that emerged are:

- **nZEB.** The presence of RES is what makes a nearly Zero Energy Building (nZEB) out of a "simple" low energy building. This concept seems to be quite generally accepted and understood, although definitions and thresholds are generally missing or insufficient or unclear.
- **Widespread technologies.** From the research done, it is rather common to have some sort of RES both in retrofit and new construction projects. Especially if also heat pumps and heat recovery from ventilation are to be considered as RES.
- **Mature technologies.** The diffusion of RES in different contexts and different Countries has been partly pushed by incentive schemes, partly by legislation, partly simply by the market

(more convenient than traditional ones). Several different RES solutions have been available as commercial, fully developed products since a few years now.

- **Simple is better.** Simple systems are generally to be preferred, complex systems requires more maintenance, and consequently more costs.
- **Monitoring.** It is important to monitor the performance of RES in buildings, otherwise the effective performance of the system installed could fall, with no one noticing it (eventually apart from the increased energy bill).
- **Information.** Apartment owners should be aware of the RES systems installed, how they work and how they can be operate/ exploit at the best

Looking at the case studies from the three Countries, several different RES have been used. PV systems are quite common in Italy, where a greater solar radiation is available and also a favourable “feed in tariff” scheme was in place (at least up to 2013). Heat pumps are common in Italy and Estonia, and they promise to become more and more common in future. Solar thermal is used everywhere, being relatively “cheap”; it is used mainly for hot water heating, and it is known to require some maintenance. Finally, Estonia shows some interesting solutions for implementing heat recovery from ventilation in renovation projects, with two different technologies: “decentralized ventilation systems” and “extracted air heat pumps”; both these technologies seems to work fine, increase efficiency and improve air quality.











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