Scaling Up Energy Efficiency in Buildings in the Western Balkans

Financing Energy Efficiency Measures for Residential Building Stock

Guidance Note

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Contents

Abbreviations and Acronyms

General

CHP	combined heat and power
DH	district heating
DHW	domestic hot water (sanitary water)
EBRD	European Bank for Reconstruction and Development
EE	energy efficiency
ESCO	energy service company
EU	European Union
EUA	European Union Allowances
EU-MS	EU member states
GEF	Global Environment Facility
GWh	gigawatt-hour
GWht	thermal GWh
HOA	homeowner association
IEA	International Energy Agency
IFI	international financial institution
NEEAP	National Energy Efficiency Action Plan
RE	renewable energy
RES	renewable energy sources
toe	tonnes of oil equivalent
Y	year

Regional

The Western Balkan region comprises Albania, Bosnia and Herzegovina, Kosovo, the former Yugoslav Republic of Macedonia, Montenegro, and Serbia:

AB	Albania
BiH	Bosnia and Herzegovina
KOS	Kosovo
MK	FYR Macedonia
MNE	Montenegro
SER	Serbia

Executive Summary

Within the Western Balkans region, a secure energy supply is critical to sustaining economic growth. Currently, the region relies heavily on imported hydrocarbons and maintains high energy intensity relative to GDP. This places a huge burden on companies, which require affordable and reliable infrastructure services to be competitive; the public sector, which spends significant budgetary resources on energy; and households, which have to pay a high portion of their income for energy services. As energy pricing is further rationalized, a higher burden will be placed on all sectors, especially poorer households.

The residential sector is a significant energy consumer. Its share of total final energy consumption ranges from 28 percent to 32 percent (compared with the EU average of 27 percent). Fairly simple renovations such as insulation, heating system upgrades, and improvements to windows and lighting could reduce consumption in this sector by some 9 percent, with payback periods generally under 8 years. Such improvements could help ease the impact of future tariff increases while helping reduce the region's projected energy supply/demand gap.

Unfortunately, there are a number of barriers preventing energy efficiency (EE) measures from being implemented in Western Balkans countries. Key ones have included:

- *Pricing barriers*: energy subsidies, absence of consumption-based billing, affordability, high cost of commercial financing;
- *Technical barriers*: lack of access to district heating (DH) or centralized heating in apartment buildings, lack of metering where DH/centralized systems exist, poor building maintenance, underheating, and lack of controls to adjust temperature levels;
- *Legal and regulatory barriers*: insufficient building code enforcement, apartment privatization and building ownership, and homeowner association (HOA) legislation; and
- *Information*: lack of awareness of EE and potential benefits, lack of information about how to implement EE measures, and limited information on quality/standards for EE materials/appliances

Governments have introduced a variety of policies, incentives, and financing/implementation programs to help remove these barriers. These include:

- *Financial mechanisms:* EE measures stimulated by subsidies, loans, or price fluctuations;
- *Fiscal mechanisms*: EE activities financed and/or stimulated by the use of taxes;
- *Delivery mechanisms*: EE activities stimulated by the availability of specific assistance or imposition of certain legal obligations; and
- *Institutions*: EE activities developed/managed by public institutions.

Lessons learned can be summarized as follows:

- The implementing agency and delivery channels should be structured to maximize the chances for widespread deployment of funds.
- The administrative burden placed on fund recipients should be tailored to the segment targeted.
- Standardization of supporting tools for smaller projects is a success factor.
- Although the level of incentive must be tailored to local market conditions, it should be clearly linked with supporting long-term growth on a commercial basis.
- The types of incentives should be consistent with the goal of supporting integrated projects that provide substantial savings.

A **roadmap** for improving EE is presented below. Taking into account the current situation in the Western Balkans, experiences from other countries (particularly of the new EU member or EU11 states (EU-MS), and lessons learned from the many EE programs launched in the EU, the following steps are recommended for improving EE and for supporting achievement of National Energy Efficiency Action Plan (NEEAP) targets:

- Step 1: Implement financing incentive schemes for single-family houses including stoves (no DH and no building-level meters)
- Step 2: Increase awareness and establish centers
- Step 3: Issue new building codes
- Step 4: Implement building-level DH metering
- Step 5: Improve HOA legislation to allow majority investment decisions financed through borrowing
- Step 6: Rehabilitate DH systems to reduce losses including reasonable expansion
- Step 7: Initiate transition to building-level, consumption-based billing
- Step 8: Request building certificates and appliance standards and labeling
- Step 9: Implement financing incentives for apartment buildings
- Step 10: Implement EE incentives to regularize illegal housing
- Step 11: Implement apartment-level heating-cost allocators as well as thermostatic radiator valves (TRVs) and consumption-based billing

1. Introduction: Why Residential Energy Efficiency is Important to the Western Balkans

Within the Western Balkans region, a secure energy supply is critical to sustaining economic growth. Currently, the region relies heavily on imported hydrocarbons and maintains high energy intensity relative to GDP. This places a huge burden on companies, which require affordable and reliable infrastructure services to be competitive; the public sector, which spends significant budgetary resources on energy; and households, which have to pay a high portion of their income for energy services. As energy pricing is further rationalized, a higher burden will be placed on all sectors, especially poorer households.

The residential sector is a significant energy consumer. Its share of the region's overall energy consumption (total final energy use) ranges from 28 percent to 32 percent, compared with the EU average of 27 percent. The share relative to total *electricity* consumption is generally more than 50 percent, with the exception of Montenegro (Figures 1.A. and 1.B.).

Because the share of residential energy use is high, this sector has an enormous impact on the overall energy efficiency (EE) programs and progress within the region. Key reasons for achieving strong impacts in the sector include:

- **Support for achieving National Energy Efficiency Action Plan (NEEAP) targets:** According to the countries' NEEAPs, envisaged savings in the residential sector are in the range of 4 to 10 percent (Figure 2).
- **Energy security:** Energy imports in the region are substantial, ranging from 31 to 43 percent of the total energy used in 2011. EE is the most economical way to enhance energy security.
- **Economic activity and job opportunities:** Investing in EE measures supports local businesses and can create job opportunities in the industrial and agricultural sectors. Construction companies, which have been hit particularly hard by the financial crisis, would benefit from increased demand for building renovations. In the agricultural sector, the need for collecting and processing biomass could create new jobs. Demand for related products, from insulation to efficient windows to biomass boilers, can help stimulate local manufacturing.
- **Increased availability of electricity service:** Electric heating—either as a primary or secondary heat source—is widespread in the region, is very economically inefficient, and presents a burden to the national electricity systems, many of which are already constrained. Reducing the electricity consumption for space and water heating by insulating buildings/windows and by installing alternative heating systems (e.g., wood-fired boilers, connecting to district heating (DH), natural gas boilers) will help to eliminate the need for large, increasingly expensive investments in new power systems.
- **Reducing subsidies:** All countries in the region provide some subsidies for utility energy service in the residential sector, i.e., electricity and DH[1] (Figure 3). Despite price increases in recent years, electricity is still cheap when compared with fossil fuels, and this is an important reason for the widespread use of electricity as a primary or secondary heating source until now.

[1] The share of residential buildings connected to DH varies: 2.5 percent in Albania, 12 percent in BiH, 5 percent in Kosovo, 0 percent in Montenegro, 27 percent in Serbia, and 48 percent in Macedonia (World Bank, "Scaling Up Energy Efficiency in Buildings in the Western Balkans,"Interim Report).

Figure 1.A. Western Balkans Residential Sector: Share of Energy Consumption

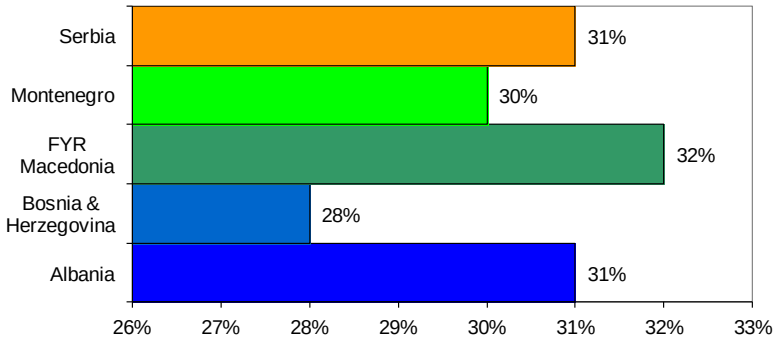
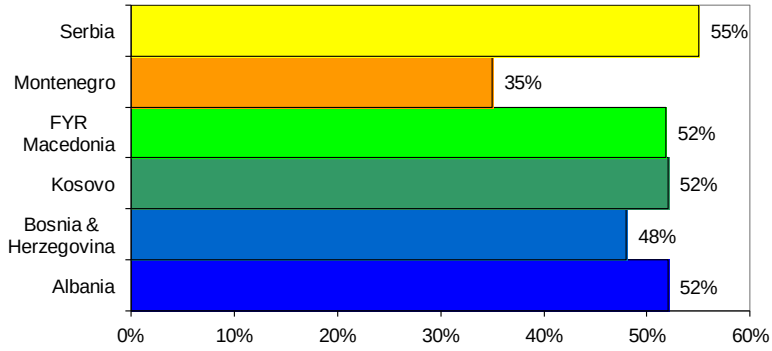
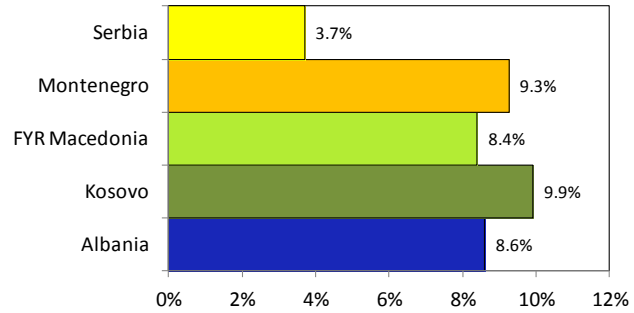


Figure 2.B. Western Balkans Residential Sector: Share of Electricity Consumption



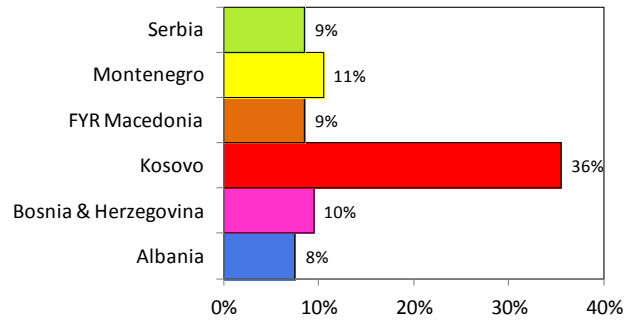
Note: BiH = Bosnia and Herzegovina. No data available for Kosovo energy consumption (Fig. 1.A.).
Sources: IEA 2008; Statistical Office of Serbia 2012; Statistical Office of Montenegro 2013.

Figure 3. NEEAP targets for the residential sector



Note: The NEEAP of Bosnia and Herzegovina is not included since it has not yet been adopted. Serbia expects much higher savings in the public building sector.
Source: NEEAPs of the countries.

Figure 4. Energy Subsidies per GDP



Note: The number for Kosovo would be smaller if the grey market were included in the GDP.
Source: The United Nations Development Programme (UNDP) estimates that fossil fuel subsidies in World Bank countries amounted to 7–11 percent of GDP in 2005-09.

EE also has important local benefits. These include:

- **Improvement of the existing building stock:** Building refurbishment improves the appearance of buildings and makes the local environment more attractive. EE measures such as wall and roof insulation and replacement of windows support the maintenance of the building stock. Panel buildings (buildings made using pre-fabricated concrete parts for cheap and fast construction), in particular, suffer from premature aging and applied low insulation standards. Refurbishment of these buildings, combined with EE measures, has been a priority of the new EU member states (EU-MS).
- **Increase in building value:** Refurbishment can increase the value of both buildings and apartments. In Serbia, it was observed that the apartment prices increased significantly after the replacement of electric heating with DH.
- **Local air quality:** Air pollution caused by harmful emissions from indoor stoves and local boilers can be reduced. Moreover, modern efficient stoves and boilers utilize fuel much more effectively and thus reduce emissions substantially.

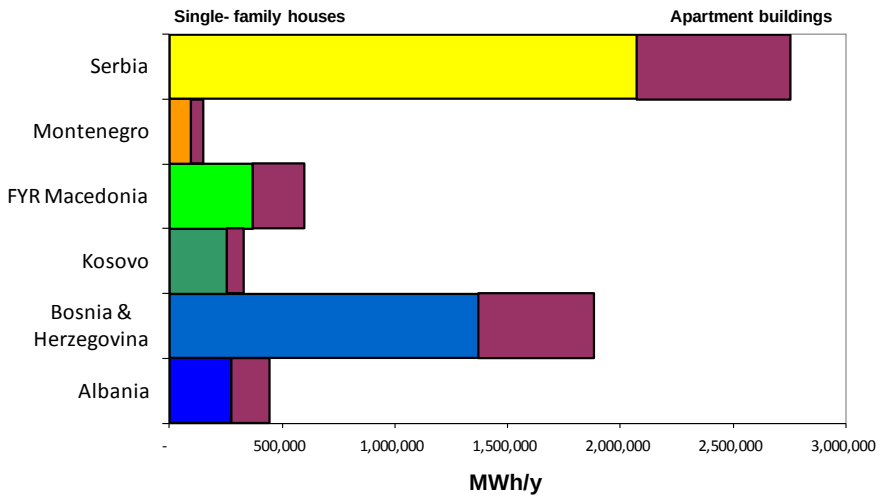
EE also has positive social and environmental impacts, such as:

- **Reduction of heating costs:** Viable EE measures reduce heating costs, which can be a significant share of household incomes. This helps cushion necessary tariff increases on the supply side and makes heating more affordable for final consumers.
- **Ability to adjust heat supply to individual needs:** Modernizing the heating system allows users to adjust heat consumption levels to their personal needs. Overheating or underheating can affect one's quality of life and health.
- **Reduction of harmful emissions:** Improving supply systems and reducing final demand will reduce production of CO_2 and harmful emissions from the burning of fossil fuels.

Energy-Saving Potential

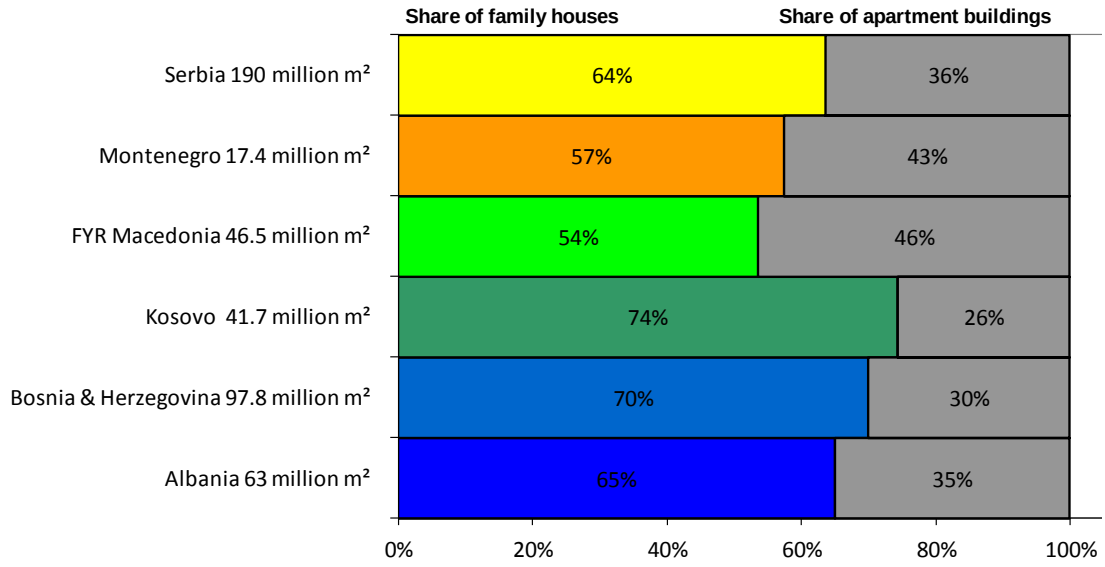
As a recent Energy Community (2012) report revealed, the region's residential building stock offers enormous energy-saving potential (Figures 4 and 5). The report determined the energy savings of a mix of EE measures, including efficient lighting, modern boilers, heat recovery, hydraulic balancing, and insulation. From a purely technical point of view, much higher savings could easily be achieved; however, payback times must be reasonable, so the measures selected should result in payback times ranging from 5.4 to 7.6 years and savings that would amount to about 9 percent of the corresponding residential energy consumption.

Figure 5. Savings Potential of Single-Family Houses and Apartment Buildings



Source: Energy Community 2012.

Figure 6. Single-Family Houses and Apartment Buildings in the Western Balkans



Source: Energy Community 2012.

It is interesting to note that the proportion of energy savings potential in apartment buildings (as a share of the total residential building stock) is significantly smaller than that for single-family houses. There are two possible reasons for this. First, the specific heat consumption (measured in kWh per square meter) of single-family houses is higher and consequently the saving potential is also higher. Secondly, investment costs per unit of energy saved are higher for apartment buildings.

Three important factors affect this potential:

1. The savings potential has been estimated by calculating the normative heat losses, assuming an indoor temperature of 20°C. In cases of underheating, EE measures could facilitate improvement in heating comfort rather than energy savings.
2. The cost of EE investments can be reduced if combined with building refurbishment.
3. Higher energy prices will increase the potential for economic savings.

It should also be taken into account that the saving potential has been calculated for a typical set of buildings. In individual cases, the savings can be much higher. A recent report by the Intelligent Energy Europe Agency (IEEA 2011) evaluated the results from a number of best-case projects implemented in various EU countries to find the most successful case. Savings of the country-specific cases varied between 45 and 90 percent.

There is a striking difference between the energy saving potentials presented above and those given in the NEEAPs. An important reason for this is the different time horizons. Whereas the NEEAPs estimate how many savings can be achieved within a certain period of time, the figures given above reflect the total savings potential of the existing building stock.

2. Barriers to Energy Efficiency

Although typical EE measures in residential buildings are economically viable and have reasonable payback periods, a number of barriers are preventing EE measures from being implemented. Financing is not listed as a separate barrier, because most commercial banks in the region have sufficient liquidity and are generally interested in lending for household refurbishment. There is also a prevalence of donor credit lines directed at clean energy. The larger barriers tend to be related to energy pricing, technical issues, legal and regulatory issues, and access to information. Table 1 briefly describes the most relevant barriers.

Table 1. Barriers to Residential EE in the Western Balkans

Barrier	Description
Pricing barriers	
Energy subsidies	Direct energy subsidies and cross-subsidies constitute price distortions and undermine incentives for implementing EE measures (increasing payback periods).
Absence of consumption-based billing	Lump-sum billing (based on heated area) for DH is still widespread, which fosters a waste of energy, as payments are not linked to actual consumption.
Unaffordable heating	With increasing tariffs, heating threatens to become unaffordable for lower income groups, which makes self-financing of EE measures increasingly difficult.
High costs of financing	Due to low household incomes, limited collateral, and poor legislation on HOAs, access to commercial bank financing is impeded or very expensive.
Technical barriers	
Lack of metering in central heating and DH systems	Identifying EE opportunities requires knowledge of actual energy use, which requires metering. Most apartment building boilers and DH systems do not have meters installed at the building level to measure heat production, heat losses, and final consumption.
Building maintenance	The poor technical condition of a large part of the building stock, along with poor maintenance practices, make implementation of EE measures difficult and expensive.
Underheating	Underheating does not of itself constitute a barrier for EE, but low energy use reduces potential for actual energy cost savings, as savings are offset by increasing comfort levels.
Lack of central heating in apartment buildings	Many apartment buildings without DH connections also lack central heating, causing high use of electric heaters or wood stoves, making replacement with efficient heating systems expensive.
Lack of centralized DH water supply systems	Hot water typically requires electricity, wood, coal, or natural gas heaters. A lack of centralized DH water systems constitutes a barrier to installation of more efficient systems such as CHP and solar water heating systems.
Legal and regulatory barriers	
Insufficient building codes	Lax regulations and enforcement of buildings codes, and slow implementation of building certificates, reduce implementation of EE measures by construction companies and apartment owners.
Dispersed apartment privatization and building ownership	Decentralized ownership of apartments makes decision-making in apartment buildings difficult and can hamper the financing and implementation of EE measures.
Poor HOA legislation	Poorly functioning or even a lack of HOAs (or other cooperative models) makes decision-making, borrowing, and contracting for EE improvements difficult in apartment buildings. Several new EU member states have solved this problem by enforcing the establishment of HOAs with clearly defined legal structures, governance rules, and obligations.
Information	
Lack of awareness about EE opportunities	Many consumers are not aware of the scope and benefits of EE measures. It is difficult to acquire information about EE measures applicable to the specific environment. Energy agencies are understaffed and local governments or utilities are usually not prepared to offer such information.
Lack of knowledge about energy use	Comprehensive know-how of energy flows, consumption, losses, etc. is typically absent. Even some DH companies do not know the extent of actual losses and final consumption. Official statistics are incomplete (e.g., details of the building stocks, local energy balance, renewable energy utilization).
Lack of standards and quality certification	Homeowners also lack information about the quality of various building materials (windows, insulation) and appliances; this can create misperceptions about EE benefits and even result in some EE investments not resulting in expected savings due to use of low-quality products.

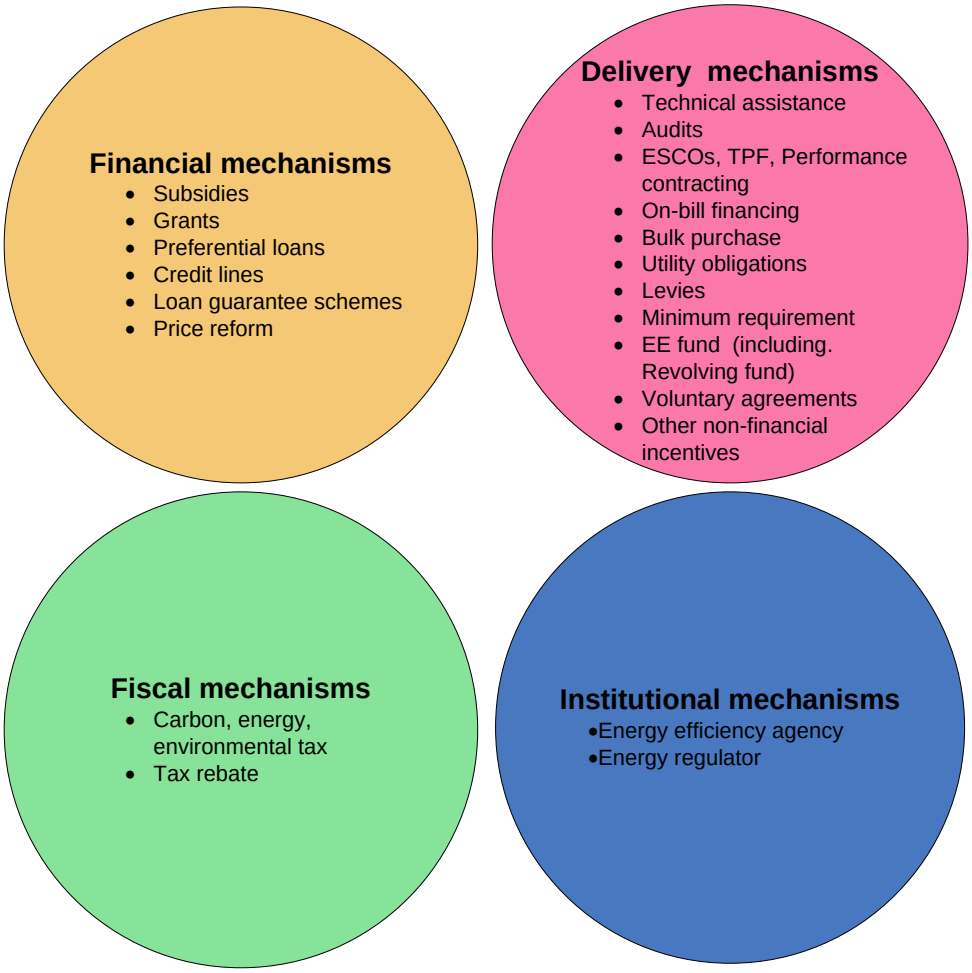
3. Approaches Countries Have Taken to Remove These Barriers

According to a recent study commissioned by the Western Balkans Investment Framework (WBIF 2013b), various mechanisms for supporting EE implementation can be categorized as follows:

- Financial mechanisms: EE measures stimulated by subsidies, loans, or price changes;
- Fiscal mechanisms: EE activities financed and/or stimulated by the use of taxes;
- Delivery mechanisms: EE activities stimulated by the availability of specific assistance or imposition of certain legal obligations; and
- Institutional mechanisms: EE activities developed/managed by public institutions.

Each of these groups comprises a number of tools (see Figure 6).

Figure 7. Range of EE Mechanisms



Source: Adapted from WBIF 2013b.

Annex A describes the most relevant tools used by the four mechanisms, including example programs or measures from various countries. In many countries, residential EE programs usually comprise more than one mechanism: financial and fiscal mechanisms need an appropriate delivery mechanism to address the beneficiaries, and often this will be also supported by institutional mechanisms. Similarly, few programs use one modality or instrument—building retrofit programs may include concessional loans, partial grants, and bank guarantees, and could also include technical assistance and audit support. Table 2 summarizes the most relevant tools, or measures, for addressing the barriers.

Table 2. Measures Taken to Address Barriers

Barrier	Measures
Pricing barriers	
Energy subsidies	Many new EU member states (EU-MS) have phased out direct subsidies for energy utilities and replaced them with target subsidies for low-income households (e.g., limit of 15–25% of their disposable income for energy).
Absence of consumption-based billing	Many new EU-MS have implemented mandatory consumption-based metering using building-wise heat metering. Within the buildings, heating costs are distributed either by heating-cost allocators or by area. The new EE Directive requires individual heat-metering or application of cost allocators for individual apartments.
Affordability	Affordability can be addressed through targeted subsidies (see "Energy subsidies" above).
High costs of financing	Access to financing is typically addressed by special programs listed above as "financial mechanisms." Most EU countries, including new member states, have launched financing programs with incentives (see case studies in Section 4).
Technical barriers	
Lack of metering in central heating and DH systems	Metering is required for understanding energy use and implementing consumption-based billing. Many energy laws or similar legislation call for mandatory metering and consumption-based billing (although this is only partially implemented in the region).
Building maintenance	Apartment owners are obliged to maintain their buildings under typical legislation, but many do not and enforcement is weak. Low incomes, high cost of financing, and poor HOAs exacerbate the situation. In new member states, programs often (co-)finance comprehensive building refurbishment, provided that a certain level of energy savings will be achieved (see case studies in Section 4).
Underheating	Underheating is typically not explicitly addressed by EE programs, but it can often be eliminated with building refurbishment and DH rehabilitation. Experience from new member states has shown that overcoming underheating is a key incentive for many apartment owners to undertake EE improvements.
Lack of central heating in apartment buildings	EE programs often involve installing new centralized heating systems. EU DH companies typically support the connection of existing buildings on favorable connection terms, which allows greater use of the DH systems.
Lack of centralized DH water supply systems	High investment costs inhibit building owners and DH companies from investing in new centralized DH water systems. The city of Krakow's (Poland) DH utility successfully supported the installation of DH water systems in connected buildings using CHP plants.
Legal and regulatory barriers	
Insufficient building codes	New EU-MS have adjusted their building codes to comply with EU standards and adopted the energy performance building certificates.
Dispersed building ownership	New EU-MS had a similarly high share of private apartments and poor HOAs, if any. Improvements in HOA legislation, combined with regulatory obligations and supporting financial programs, have helped address these barriers.
Poor HOA legislation	Promoting HOAs or similar structures, modifying decision-making rules, and facilitating HOA borrowing/contracting have helped increase EE.
Information	
Lack of awareness about EE opportunities	In other countries, EE agencies and/or utilities provide information via many channels (brochures, seminars, TV/radio) and EE information centers.
Knowledge about energy use	DH utilities elsewhere regularly collect and process metering data in their full-service territory, which can help municipal and utility planners. Building typologies, such as the EU-sponsored TABULA program, defines typical buildings and their energy use patterns.
Lack of standards and quality certifications	Most EU-MS have established national standards for appliances and building materials. Although some countries in the Western Balkans have done this, the standards are only partially implemented and not yet enforced.

International experience suggests that building and apartment owners need incentives to invest in EE. While some may be sufficiently motivated by lowering energy bills or improving the comfort and value of their apartments, many countries have still introduced some types of financial incentives—either financial or fiscal mechanisms. Financial incentives are affordable and appropriate for countries with sufficient resources, which most Western Balkans countries unfortunately do not have. New EU member states were able to finance their EE programs with EU structural funding. For the time being, countries in the Western Balkans will have to rely on

financial support from international financial institution (IFIs), bilateral sources (including the EU Instrument for Pre-Accession Assistance, or IPA), or local budgets.

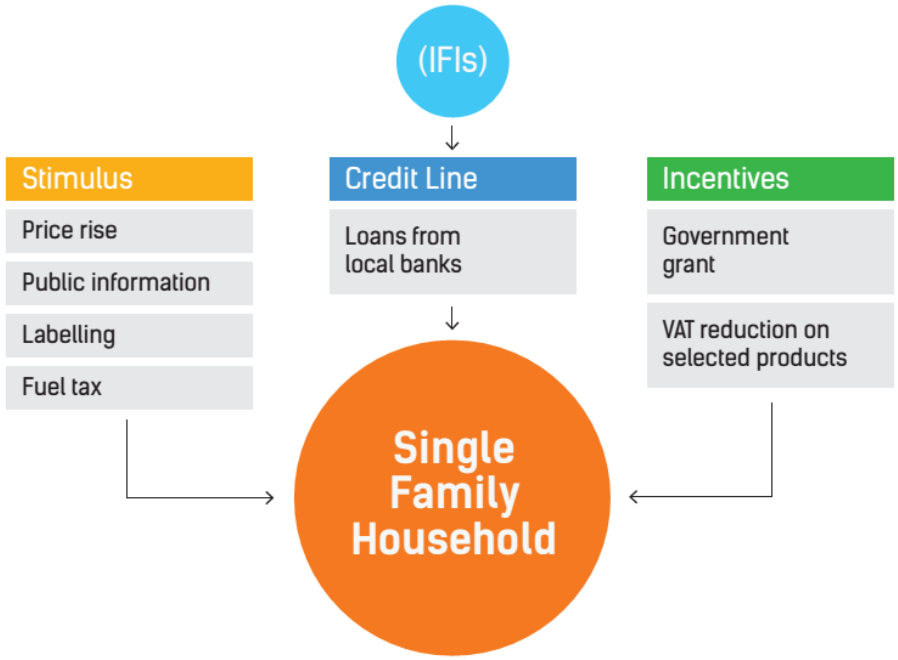
However, not all residential EE programs require state budget contributions, such as energy supplier obligations and on-the-bill financing. In these cases, utilities arrange for financing of EE improvements. In the Western Balkans, though, the poor financial positions of utilities (particularly DH and electricity companies) make such approaches unviable in the near term. Moreover, most of the utilities in the region most likely do not have substantial experience in, or the expertise needed, to develop and implement EE projects in the residential sector.

As long as funding of incentives is a problem, the region's governments may have to rely more on market and regulatory approaches, such as:

- Fostering the commitment of the private sector through credit lines and other financing schemes, possibly using loan guarantees, interest rate subsidies, or partial grants. However, the poor creditworthiness of dwelling owners and underdeveloped HOAs limits market penetration rates for such schemes. Therefore, strengthening the position of HOAs, enforcing their establishment, and clearly defining powers and decision-making procedures and obligations would be an essential step forward. This would improve the conditions for applying third-party financing including energy equipment and service companies (including ESCOs), bulk purchasing, and other delivery mechanisms.
- Implementing price reforms, removing direct energy subsidies and cross-subsidies.
- Implementing consumption-based billing for central heating, along with the promotion of apartment-level controls and devices (heat allocators, thermostatic radiator valves, etc.).

For the reasons mentioned above, approaches to single-family houses and apartment buildings could be different. Figure 8 shows a scheme for single-family houses. More-affluent households could be motivated by price rises supplemented by information available to the public. If only this market segment is targeted, a VAT reduction for individual appliances (such as stoves and boilers) or windows may be sufficient to promote EE. Larger, more complex refurbishment, however, may require financial incentives, such as grants or favorable credit lines.

Figure 8. Approach to Single-Family Houses

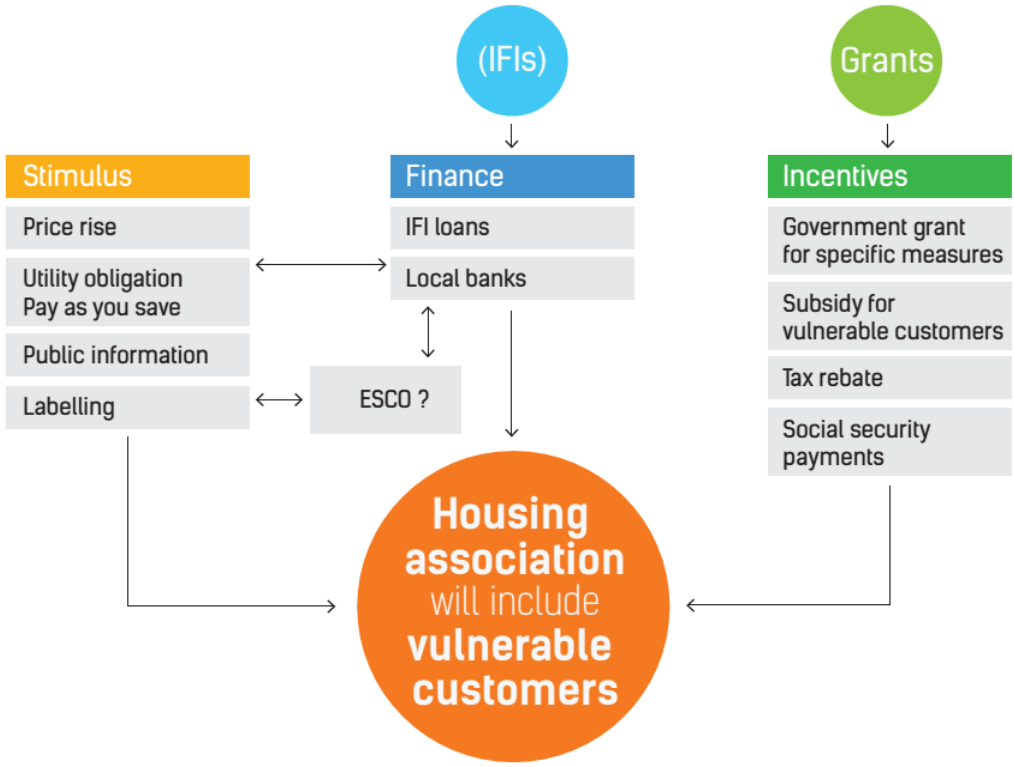


Source: WBIF 2013b.

Figure 8 shows a scheme for multi-family apartment buildings. For measures that can be implemented by individual apartment owners, such as window replacement, similar approaches

for single-family homes could be used. Insulation of walls and roofs, improvement of internal heat distribution, etc., however, require investment in common areas and property, which would require some collective organization or HOA. The creditworthiness of the HOA will then become a key parameter for access to financing.

Figure 9. Approach to Apartment Buildings



Source: WBIF 2013b.

4. Case Studies

This section presents case studies that illustrate the mechanisms described in Section 3.

Financial Mechanisms

Case Study 1: Grants and Subsidy Programs—the Polish THERMO Modernization Fund

The THERMO Modernization Fund, established by the Polish government in 1999, aims at refurbishing the existing building stock in both public and residential buildings. The program was sponsored by the state-owned Bank of National Economy (BGK) and the Ministries of Finance and Infrastructure.

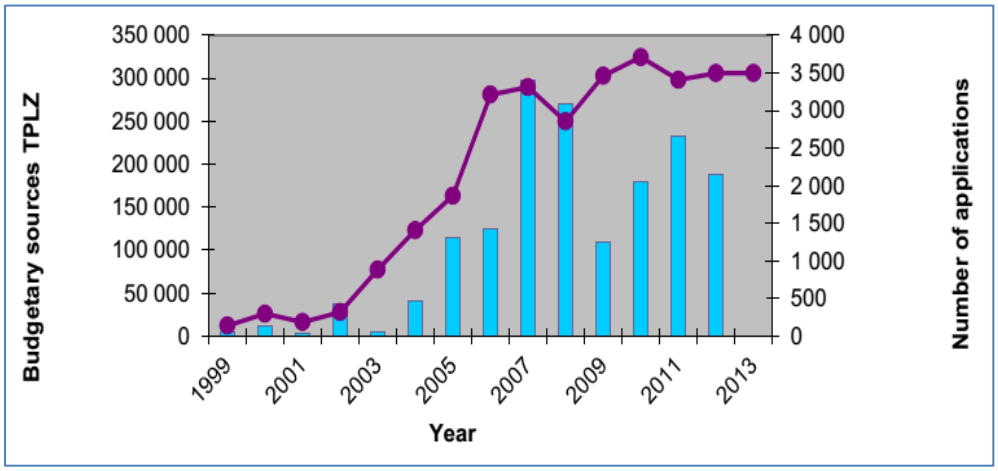
Eligible investments had to meet certain technical and financial criteria, which had to be verified by an energy audit and financial analysis. The energy savings had to amount to at least 25 percent for a comprehensive building refurbishment. In the case of a modernization of indoor heating or local heating systems as well as DH systems, this figure had to be at least 10 percent, and in the case of refurbishment of buildings constructed before 1961, the threshold was 10 percent.

Individual projects were usually financed by a loan amount of up to 80 percent of the total project costs. Provided that the loan (plus interest) could be repaid within 10 years (the maximum term of the loan), the BGK could offer a grant bonus of up to 25 percent.

Until mid-2002 the THERMO Modernization Fund was not very successful. This was mainly due to complicated application procedures (for housing cooperatives, for example) and high interest

rates (up to 30 percent). From 2003 on, after the conditions had been relaxed and promotional activities were implemented, the number of applications increased significantly (see Figure 9). Unfortunately, the fund's resources were not sufficient to meet this growing demand. In terms of applications, 40 percent came from HOAs, 40 percent from housing cooperatives, 7 percent from single-family homeowners, and 13 percent from others. By 2013, the program was operating well with a budget of about €37 million. While the program remains under implementation, no budget for incentives was allocated for 2014.

Figure 10. Budgets and Applications for the THERMO Program, 1999–2013



Source: Rajkiewicz 2013. TPLZ = Polish zloty (PLN).

Case Study 2: Grants and Subsidy Programs—The Czech Green Savings Program

The Green Savings Program was initiated by the Czech Ministry of Environment and was under implementation from 2009 to 2012. The program provided support for heating installations utilizing renewable energy (RE) sources as well as investments in energy savings in renovated and new buildings. Both single-family houses and multi-family apartment buildings were eligible; EE and RE measures included insulation, biomass boilers, heat pumps, and solar thermal collectors, as well as new passive energy houses.

Funds for the program were generated from the sale of emission credits under the Kyoto Protocol, and these funds were used towards the purchase of some of the EE/RE equipment. Support was given for select combination of measures. The amount of subsidies paid under this program amounted to €710 million. The average subsidy amounted on average to 67 percent. About two-thirds of the energy savings came from apartment buildings, while the rest came from single-family buildings.[2]

An important feature of the program was that product and service providers had to be certified, which was critical in ensuring the quality of measures implemented. While this restriction did result in a slow rollout early on, the program was able to substantially increase its pace and be successful.

Estimated benefits of the program included the following:[3]

- Reduction of CO_2: 1,100,000 t/yr (2008-2013)
- Reduction of local dust pollution: 2,200 t/yr (2008-2013)
- Energy savings in heating: 6.3 PJ
- Increase in heat generation from RE sources: + 3.7 PJ

[2] M. Valentinovy, "The Green Investment Scheme in the Czech Republic – Green Savings Programme."
[3] Pavel Zámyslický, "Contribution of the GIS to low carbon development in the Czech Republic" (Ministry of Environment of the Czech Republic, n.d.).

- Creation or retention of 30,000 jobs
- Reduced dependence on energy imports, emissions of other local pollutants (SO_2, NO_x)

The program was revised in 2013. The subsidy was reduced to 25 percent and a minimum energy savings of 40 percent was required. If the reduction was at least 60 percent, the subsidy was increased to 50 percent. Because these subsidies are being financed by the sale of European Union Allowances (EUA), the total funding of the program is not fixed.

Case Study 3: Credit Lines—The CO_2 Building Retrofitting Program of KfW

Germany's CO_2 Building Retrofitting Program was started by KfW in 2001. It supports comprehensive retrofitting of buildings built before 1979, replacement of old heating installations, and construction of energy-saving houses. To be eligible, participants must either implement one of the prescribed measure packages or prove a CO_2 reduction of at least 40 kg/m^2 per year. In the first case, renovation of the heating installations and the minimum insulation measures that exceed the national standards have to be implemented. In the case of the CO_2 reduction scheme, the legal minimum requirements related to the heat insulation are obligatory. The scope of eligible applicants covers a wide range, starting with private persons and continuing on to housing companies and to commercial and regional authorities and their enterprises.

The financial instrument used to be a loan provided by KfW to the building owner, with subsidized interest rates, based on the following principle: the higher the energy savings, the lower the interest rate. Later, the possibility of obtaining subsidies instead of concessional loans was added to the program.

In 2009, under this program approximately 53,000 dwellings were refurbished, eliminating some 211,000 t/yr of CO_2 and energy saving 589 GWh/yr. Together with the program for the "Energy Efficient Refurbishment of Buildings," subsidy payments amounted to €87 million and the total investment volume amounted to €6.96 million. These investments helped to create some 60,000 direct and 51,100 indirect jobs.

Fiscal Instruments

Case Study 4: Reduced VAT for EE in France

There are several regulations in force in France that allow reduced VAT for EE measures (GreenMax Capital Advisors 2009). The first, introduced in 1999, reduced the tax from 20.6 percent to 5.5 percent for building refurbishment in dwellings older than two years. Results from a 2002 study revealed that 61 percent of households that have invested in EE have benefited from this VAT reduction. In total, 7 percent of France's 25 million households have invested in home restorations, with an average investment of €2,640 per household. Estimated CO_2 reductions amounted to 0.6 t/household, or 1 MT of CO_2 in total for 2002.

Another regulation, the "Tax Credit for EE Materials and RES," came into force in 2005. The tax credits (15–40 percent) applied to the purchase price of efficient boilers, insulation, heating regulators, and the use of RE systems. Provisional results for 2005 showed substantial increases in single unit sales compared to 2004, in particular for solar water heating, combined solar systems, wood-fired boilers, and condensation boilers. Tax credits were seen to have revitalized the market for energy-saving equipment. The market size in 2006 was estimated at €3–4 billion.

Delivery Mechanisms

Case Study 5: Funds—Energy Efficiency Funds (Bulgaria)

In Bulgaria there are currently two grant/loan schemes available for retrofitting housing. Grants and loans are provided by two entities:

1. The Bulgaria Energy Efficiency Fund (BEEF), which provides investment support for EE projects. BEEF, which is managed as a public-private partnership, offers (i) loan guarantees; and (ii) loans with interest rates lower than market rates. Examples of projects that BEEF finances include retrofitting of residential and public buildings, improvements of DH systems, and municipal street lighting. The Fund acts both as a financial institution and a consultancy center. The initial capitalization of BGN 22 million was made up of grants (as equity contributions) from the Global Environment Facility (GEF) through the World Bank and the Austrian and Bulgarian governments. In 2010, the Fund supported 90 projects (with a total investment volume of €37.6 million) and financed €25.8 million.[4]
2. The Residential Energy Efficiency Credit Line (REECL), established by the European Bank for Reconstruction and Development (EBRD). The REECL facility is aimed at giving households across Bulgaria an opportunity to realize the benefits of energy-efficient home improvements by providing them with loans and incentive grants through local participating banks. Eligible sub-projects include EE improvements such as thermal insulation, energy efficient windows, efficient (gas/biomass) boilers and solar water heaters. Incentive grant support is available from the REECL Program in conjunction with loan financing from the participating banks. The conditions are as follows[5]:
    - *Building-level projects*: Subject to the REECL terms and conditions, borrowers are entitled to receive payment of incentive grants equal to 30 percent of the total amount of REECL loans for any building-level projects and 35 percent for building-level projects undertaken by HOAs and encompassing measures on both building envelope and building service systems.
    - *Dwelling-level projects*: Subject to the REECL terms and conditions, borrowers are entitled to receive payment up to 20 percent of the total amount disbursed by a participating bank for dwelling-level projects, provided that the incentive grants payable in respect of each eligible EE measure do not exceed a certain maximum amount and the total incentive grant per borrowing householder does not exceed the cap of €9,000.

So far, the REECL Programme has committed to 48,171 EE loans totaling BGN 144,347,146 and incentive grants amounting to BGN 27,212,176. To date, the REECL-financed projects have saved a total estimated electricity equivalent of 221,228 MWh per year. The REECL-supported projects have brought reductions in CO_2 emissions of 322,345 tonnes per year.[6]

Case Study 6: Utility Obligations in France and UK

Several countries in the EU—including Denmark, France, Italy, and the UK—use Energy Efficiency Obligations (EEOs) in the form of White Certificates and Energy Efficiency Certificates. Under both approaches, energy suppliers have an obligation to achieve a certain level of energy savings from their customer bases. In the UK, this program is confined to the residential sector. In both countries, energy suppliers have to pay penalties in case they do not achieve this level. The amount of the penalty varies: in France, it amounts to €20 per MWh;[7] in the UK, it is £35 per MWh. The UK applies the principle that the penalty should exceed the cost of delivery.[8] In both countries, standardized EE measures have been defined that are eligible for this program.[9]

[4] Dimitar Dukov, *The Bulgarian Energy Efficiency Fund – Development of the Local Energy-Efficiency Market*.
[5] http://www.reecl.org/grants.php.
[6] http://www.reecl.org/statistics.php.
[7] République française, Note from the French Authorities; Subject: Energy efficiency action plan for France, 2008.
[8] European Commission, *Energy Saving Obligations and Tradable White Certificates* (report prepared by the Joint Research Centre of the European Commission, 2009).
[9] At least in the UK, these figures are rechecked from time to time.

Under the White Certificate approach, energy suppliers have to provide subsidies to final consumers (i.e., the investors in EE measures). The amount of the subsidies has not been determined by the program, but the energy suppliers can design it case by case and can also take into account the actual energy prices.

The programs also differ as to how measures are selected:

- In the United Kingdom, the energy suppliers manage implementation of the energy-saving measures. Under this approach, lower equipment prices can be achieved by means of centralized procurement and program costs can be reduced. Costs of the measures are shared between consumers and energy suppliers. In the UK, the list of eligible EE measures comprises insulation measures, electrical appliances, and radiators, condensing boilers, radiator valves, heat pumps, energy-saving bulbs/lamps, and so on. For non-priority group households, the average level of subsidies was assumed to be around 50 percent for most measures. For the priority group, subsidies amounted to up to 100 percent.
- In France, final consumers arrange and manage the investment measures individually. The consumers will be refunded after submitting the invoices of the installation companies. Principally, the investment is first financed by the apartment or building owners who have been motivated by the advice given by the respective utility and by the envisaged subsidy. The program defined a larger number of eligible measures. In addition, alternative measures can be implemented provided that they have been approved. In the residential sector the focus of the program is on insulation, flue-gas condensing boilers, and energy-efficient devices such as lamps.

There is an important difference between supplier obligations and soft loan/grant/subsidy programs. In the latter case, achievement of the targets depends on the (voluntary) willingness of final consumers to approve such measures. The approach obviously requires well-educated consumers who are aware of the energy and climate-change issues. In the case of supplier obligations, the energy suppliers are responsible for achieving the targets, but their programs are still voluntary for their clients.

Case Study 7: ESCO-type Model in Lithuania

The "Multi-apartment Buildings Renovation Program" was launched in 2009 with the support of JESSICA Holding Fund. A new model based on the "EnerVizija" (or "Energy Vision") initiative, it is an ESCO-type approach supported with up to a 15 percent subsidy (and later with an additional 25 percent subsidy from the Climate Change Fund) and soft loans with a 3 percent-fixed interest rate from the JESSICA financing mechanism. The new financing model involved renovations loans provided not only to the apartment owners, but also to municipal program administrators. These changes have accelerated the modernization process in Lithuania. Subsidy procedures for low-income persons have also been revised to facilitate the renovation decision-making process among apartment owners.

This program implements the Lithuanian housing strategy, whose objective is to ensure effective use, maintenance, and modernization of housing and rational consumption of energy. During 2013, after approval of alternative ESCO-type model, the achievements were as follows:

- 1332 projects were approved by the Housing Energy Saving Agency (HESA)
- 917 project apartment owners made decisions to rehabilitate their homes
- 490 projects were approved by urban development funds
- 322 projects started procurements
- 194 projects started renovation works

The program's objectives until the end of 2020 are to reduce heat (fuel) consumption in renovated buildings by no less than 20 percent, to achieve annual heat savings of no less than 1,000 GWh, and to reduce CO_2 annual emissions by no less than 230,000 tons.

The total budget amounts to €227 million. The sources of funding loans are:

- €127 million in EU Structural Funds from the European Regional Development Fund (ERDF), one of the EU Structural Funds under the Cohesion policy allocated to fund local infrastructure projects; and
- €100 million from state budget resources.

Other Innovative Approaches

There are a number of new innovative approaches to financing, such as:

- *Bulk purchasing*: The British organization Transition Linlithgow[10] is a community pioneering this approach. In 2011 it had 120 homes with solar water heating installed with a further 80 projected for the remainder of the year. Cooperatives benefit from bulk-purchase agreements as well. Many countries have used bulk purchases of compact fluorescent bulbs (CFLs) to reduce peak loads and promote efficient lighting.
- *On-bill financing*: On-bill utility programs have been piloted as early as 1993 (New London Resource Project, Wisconsin), but have recently seen a surge in popularity in the United States. Utilities pre-finance EE investments and after implementation customers have to pay back the costs through their utility bills. The main advantage is a reduction or elimination of first costs for customers, generating immediate positive cash flow; monthly energy savings are equal to or greater than the repayment charge.

5. Lessons Learned

International experience shows that countries have chosen different approaches to promote EE in the residential sector and used a variety of different financial instruments. Several countries have seen significant outcomes using various mechanisms, so there is no preferred or optimal program model. On the other hand, many other countries have not conducted ex-post evaluations to determine the overall impacts or cost-effectiveness of various schemes. This is because such evaluations are complex and can be costly, with methodological challenges in accounting for proper baselines, changes in comfort levels and behavior, changes in energy-use patterns as consumers' incomes rise, and so on. In addition, countries have different views about the role of government in improving EE in private households.

Still, the review of global experience indicates a number of common elements from programs that have reported substantial impacts. Successful residential EE programs have had to overcome or at least mitigate most of the major barriers to EE, including the higher upfront costs. Financial incentives reduce either the upfront costs through grants or tax reductions or the running costs through loans with subsidized interest rates. Grants, subsidies, preferential loans, and credit lines are typically used to support larger building insulation and refurbishment measures. In the new EU-MS and the countries of the Western Balkans, investment costs relative to average household incomes are much higher than in the old EU-MS, and most homeowners cannot afford to finance the full investment costs of such measures. Therefore, the high level of financial support used in the new EU-MS must be high in the Western Balkans as well, if buildings are to be refurbished to a tangible extent.

By contrast, VAT tax reductions are typically applied for individual devices or materials rather than for complex measures, such as building refurbishment. Reduced VAT rates for energy-efficient wood stoves and boilers or gas-fired condensing boilers could stimulate the replacement of outdated devices. By employing relatively simple application procedures, such programs can be more easily administered without engaging a large staff.

[10] http://transitionlinlithgow.org.uk.

Removing price distortions is another important challenge. Efficient DH systems can hardly survive in the longer run if retail gas prices for tariff customers are lower than for DH companies. Similarly, inefficient electric heating will be perpetuated if electricity prices continue to be subsidized. Therefore, in order for such programs to provide an attractive financial benefit to households, they must pay back within a reasonable timeframe—which may require rationalizing energy costs, as many of the case study countries have had to do (see Section 4).

Delivery mechanisms can directly address certain barriers, such as a lack of HOAs. In Estonia, for example, the state-owned Credit and Export Guarantee Fund KredEx used to provide guarantees for loans made to apartment buildings for renovation purposes without a legal representative body. ESCOs and on-bill programs can address the problem of access to commercial bank financing by pre-financing the upfront costs. EE Funds can help to overcome the problem of lacking or insufficient knowledge on EE by providing technical advice.

Institutional mechanisms will usually address very specific problems:

- A regulation requiring (at least) building-level heat metering would not directly achieve energy savings, but would help to forecast energy savings more precisely and to choose the optimum EE measures. It is also a necessary precondition to actually reducing energy bills from EE measures, without which EER financing would not be viable.
- Issuing regulations requiring mandatory consumption-based billing would not directly improve EE but would also be a prerequisite for achieving EE and cost savings in apartment buildings. For example, as long as heating is charged by lump-sum billing, consumers will have no incentive to save energy even if the radiators are equipped with the right control devices (e.g., thermostatic valves).
- Another important prerequisite for achieving EE are strong HOAs, which can take decisions on building maintenance and refurbishment based on majority decisions.
- A properly endowed Energy Efficiency Agency will help to overcome information lacking on EE measures and motivate households to invest. These agencies can also help organize technical assistance programs—from training of HOA energy managers to standardizing EE measures to helping to certify and organize potential service companies and banks.

A study[11] that analyzed EE programs in 11 European countries summarized the lessons learned as follows:

1. "Market enablers"—i.e., implementation of supporting measures such as regulations, standards, and legislation—are of the utmost importance. If these market enablers are not in place, program implementation will slow down. An example is ESCO services that a municipality can only utilize if the corresponding procurement rules are in place. Another example is the absence of consumption-based billing. Most heat consumers will only be interested in EE measures if such measures can decrease their heating bills. It is also necessary to have agencies that can disseminate the corresponding information.
2. The implementing agency and delivery channels should be structured to maximize the chances for widespread deployment of funds. New programs should be built on existing programs and organizations if available, rather than copying new ones from other countries. In this context it will also be important to describe explicitly the existence of competing or complementary goals between a planned program and other ongoing programs. For each segment, a clearly responsible authority, transparent funding mechanisms, and a long-term commitment to the program are required to achieve a successful program.
3. The administrative burden placed on fund recipients should be tailored to the segment targeted. For most of the programs assessed, the report found that the level of savings measurements was not particularly high, which is likely due to a cost-benefit trade-off among program designers (or in some due to political considerations). Especially when

[11] GreenMax Capital Advisors 2009.

assessing the household sector, the costs of measuring energy savings very accurately would not offset the benefits of more detailed assessments or administrative procedures. Typically this is addressed by defining lists of eligible product types or smaller projects, while only requiring more costly upfront analyses in cases of larger commercial premises or blocks of flats.

Standardization of supporting tools for smaller projects is a success factor. Tools benefiting from standardization could include building modeling, energy auditing, product guidelines, and definition of EE measure packages.

4. Although the level of incentives must be tailored to local market conditions, it should also be clearly linked with supporting long-term growth on a commercial basis. Subsidy needs should be constantly updated, aiming to prevent the market from becoming distorted. Market stability is essential so that equipment suppliers and other stakeholders can adapt. This requires transparency so that the average level of subsidies can be assessed.

   Guarantee funds in emerging markets should successively be reduced and eventually be phased out after a clearly defined period of time as lending becomes a mainstream activity. Similarly, tax credits should have a clearly defined life, presumably after a specified target has been achieved.

5. The type of incentive should be consistent with the goal of supporting integrated projects that provide substantial savings. There is no one single "right" financial support mechanism. Each country has to develop its own approach based on experience, economic and financial resources as well as culture. Bank guarantees and grants are useful, if financing for funding is available. Fiscal instruments may be less suitable if tax payments are small or are even avoided. EE and savings targets will only be achieved if the appropriate financial tools ultimately support integrated and comprehensive measures. It is reasonable and useful to use differential subsidy levels depending on the project scope. Complex EE packages of measures will usually achieve high savings and predictable results are more likely to be certain.

Regarding the technical barriers, some lessons should be taken into account:

- In the longer run there is no way to get around metering. All new EU-MS have installed meters in DH-supplied buildings and, according to the new EU Directive, it must be extended to all central heating systems supplying apartment buildings.
- The existing building stock needs refurbishment to prevent total deterioration. Experience has shown that this can and should be combined with EE measures. Financial support should be linked to achieving a certain level of energy savings.
- The problem of under-heating is usually resolved within the framework of DH rehabilitation and building refurbishment measures. There is no need to develop a special program to solve this problem.
- A lack of central heating is mostly a problem in the Western Balkans rather than in the new EU-MS. Central heating systems have to be installed to replace electric heating and individual (wood- or coal-fired) stoves in apartment buildings. This could be combined with a building refurbishment program, but could also be addressed by utility obligations.

6. Roadmap

The development of EE in the building stock in the Western Balkans is lagging significantly behind the expectations fuelled by the respective government NEEAPs. To scale up EE in the residential sector, where most of the potential in the building sector lies, a mix of legal-institutional, financial, and technical measures must be developed and implemented.

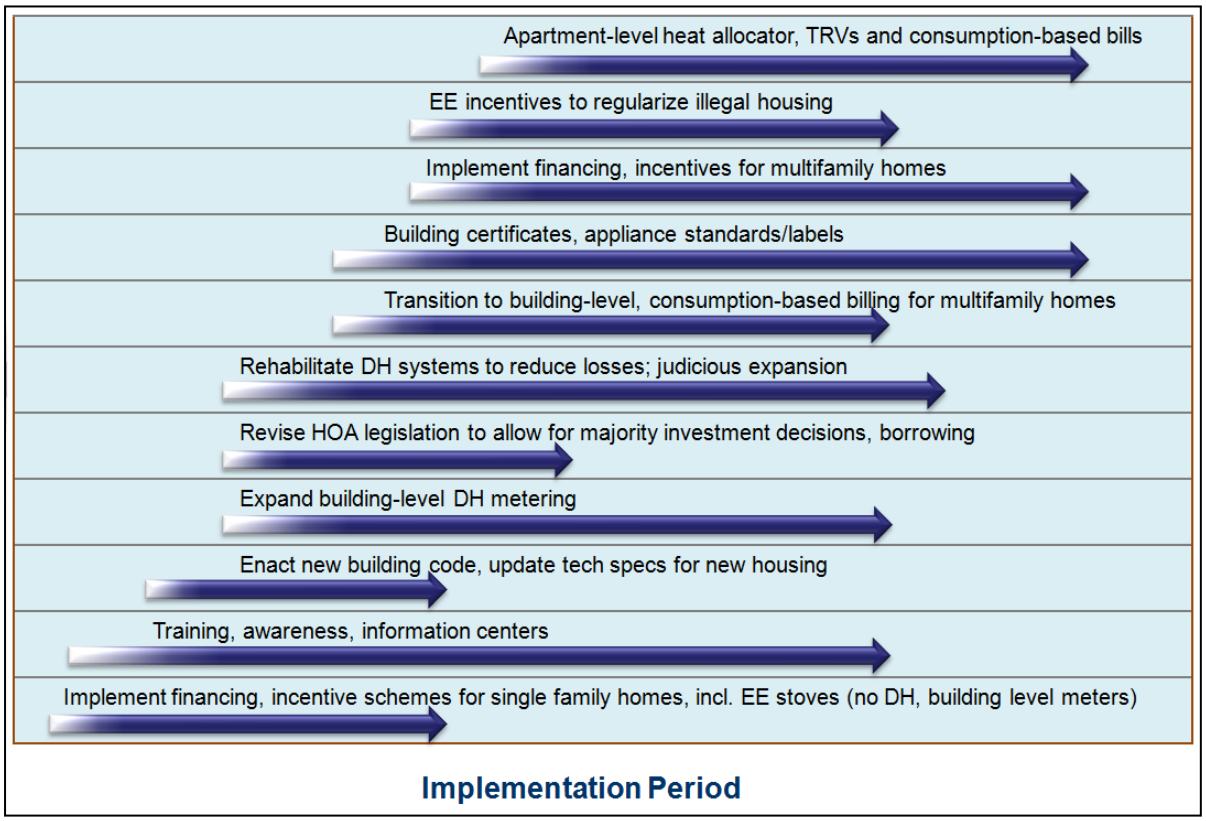
Achieving 9 percent of the energy-savings potential in this sector would require mobilizing some €2.7 billion, saving €343 million and 6162 GWh per year (Energy Community 2012). EE

improvements can also yield significant side-benefits, including enhanced comfort levels, improved building aesthetics (and home values), improved health, and reduced vulnerability to future tariff increases as well as additional employment (see, for example, the case study on the KfW CO_2 Program in Section 4). Although the presumed EE measures are viable with reasonable payback periods, there are a number a barriers slowing down or even preventing implementation. The lack of financing is the most obvious barrier, but it is also hampered by a number of other gaps. Market enablers such as supporting regulations and legislation have not been developed adequately. These gaps have been described previously.

Lessons learned show that implementing EE programs in the residential sector is very resource-intensive and requires both a long-term commitment and sector reforms that help to create an enabling environment and proper incentives. Marketing of EE to households should highlight the substantial savings in energy costs and side-benefits (such as improved comfort) in order to stimulate demand. Supporting regulations to address HOA governance and borrowing, metering and billing reforms, heating controls, appliance labeling, and building codes/certificates are critical to helping drive the market. Moreover, development of accompanying programs to provide accessible and affordable financing, targeted incentives, information and training, etc. can assist homeowners in implementing the EE measures.

Scaling up EE in residential buildings is complex and requires a multi-pronged, phased approach that combines six key elements—metering, customer controls, pricing and billing reforms, incentives, and financing, as well as information and education.

Figure 11. A Roadmap for Scaling Up EE in Residential Buildings in the Western Balkans



Source: World Bank 2013.

The following activities should be undertaken in the short term:

- **Recommendation 1 – *Implement financing and incentive schemes for single-family homes*:** Single-family houses use more heating energy than apartment buildings, EE measures are less expensive, and there is usually only one single owner. Accordingly, EE measures are easier to implement and no additional market enablers are needed. For

individual measures, such as window or stove/boiler replacement, VAT reductions could be applied.

- **Recommendation 2** – ***Conduct information outreach***: Insufficient information about costs and benefits of EE measures is a serious barrier. The group of residential consumers and dwelling owners is heterogeneous in terms of knowledge, interests, demands, aspirations, and financial capabilities. Awareness campaigns and public education can help to overcome or at least help to mitigate this problem.
- **Recommendation 3** – ***Enact new building codes:*** This will not only help to construct more energy-efficient buildings, but could also set new, more demanding standards for the refurbishment of buildings.
- **Recommendation 4** – ***Take a balanced approach to consumption-based billing***: The significance of consumption-based billing has been emphasized previously. This should be implemented in two steps. In the first step, meters will be installed at the building entry or staircase (in larger buildings), and the connected apartments will be charged according to the meter readings. In the second step, apartments will be equipped with control devices (thermostatic valves) and heating-cost allocators (or with sub-heat meters). The scheme should be extended to all central heating systems (not only DH).
- **Recommendation 5** – ***Revise HOA legislation***: To scale up the refurbishment of apartment buildings, it will be necessary to enforce the establishment of HOAs, to strengthen their powers, to allow majority decisions on measures necessary for building maintenance, and to allow easier bank borrowing and entering into contracts.
- **Recommendation 6 – *Rehabilitate DH systems***: Rehabilitation of DH systems has started, but is far from being finished. Most existing DH systems have to be rehabilitated and modernized, as the equipment is outdated and has been badly maintained in the past two decades. In additional to technical equipment, rehabilitation should include institutional measures, starting with new tariff and billing systems and continuing to the commercialization of the sector. Several DH systems have had to be closed down due to a lack of financing; a close examination should be made to determine whether such DH systems should be rehabilitated or reconstructed, with promotion of cogeneration as an additional heating source.
- **Recommendation 7** – ***Transition to building-wise, consumption-based billing***: This is a first step towards flat-wise, consumption-based billing. Once meters are in place, consumption-based billing should implemented one heating season after meters have been installed to allow the DH utility to collect reliable baseline consumption data.
- **Recommendation 8** – ***Implement building certificates and appliances standards/labels***: A certificate is aimed at influencing building developers and real estate owners to build with greater EE and implement energy-savings measures in renovation projects as a consequence of the EU Energy Performance of Buildings Directive (2002/91/EC). EU member states must implement Energy Performance Certificates (EPCs). The recast of the EPBD (Directive 2010/31/EU) in 2010 has even further focused attention on developing the right policies and on the importance of the EPCs. Similar to the Building Certificate, appliance labeling provides an idea about the energy consumption. In principle, the labeling approach could also be applied for material that is eligible for EE financial support programs (as mentioned in Section 4).
- **Recommendation 9** - ***Implement financial incentives for multi-family (apartment) buildings***: As illustrated by the experience of the new EU-MS, tangible financial incentives are often required to increase participant rates and investment for EE investments in this sector. Where payback periods are excessive—due to low energy pricing, low comfort levels, or high material costs—some incentives may be necessary to bring the payback periods within the investment threshold of many household owners.

- **Recommendation 10** – ***Establish EE incentives to regularize illegal housing***. Within the Western Balkans there are many illegally constructed houses whose efficiency levels are often poorer than average. By providing homeowners with favorable loans or grants for EE measures, efforts can be made to both upgrade their homes to meet national requirements while saving energy and regularizing them. Providing a legal status and property rights could serve as a big incentive for them to participate in such programs.
- **Recommendation 11** – ***Require heat cost allocators and individual consumption-based billing***: Heating-cost allocators are a proven instrument to measure the individual (radiator-level) heat consumption. New buildings could be equipped with heat meters, but need horizontal piping. Heat meters measure precisely the heat supplied by the piping, but not the heat transfer from neighboring flats. Moreover, as they do not register in-house heat losses, they should only serve as sub-meters, i.e., to distribute the heating costs measured at the building meter. Once individual consumption-based billing becomes mandatory within the EU in a few years, the Western Balkans will have to do this anyway. Heating-cost allocators are usually paid by the dwelling owners in the EU-MS. There is some anecdotal experience showing that consumers start to look for heating-cost allocators once they have gained some experience with building-level metering.

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Annex A. Mechanisms for Promoting EE

Table A1. Mechanisms for Promoting EE

Mechanism	Description	Example
Financing mechanisms		
Subsidies	Subsidies on efficient products	The Chinese government launched a nationwide program in 2008 to subsidize the use of 150 million energy-efficient lighting products, in a bid to reduce electricity consumption by 29 billion kWh by 2010.
Grants	Grants aimed at covering a part or all of the costs of implementing EE measures	The Green Savings Program, initiated by the Czech Min. of Environment, was in force in 2009–12. It focused on support for heating installations utilizing RE sources and investment in EE in reconstructions and new buildings. In the first phase, the grant was 67%; in 2013, the grant was reduced to 25% and a minimum energy saving of 40% was required. If the reduction was at least 60%, the grant was increased to 50%.
Preferential loans	Government- or IFI-sponsored loans on favorable terms for EE investments	The "THERMO Modernization Fund" was established by the Polish Government in 1999, aimed at refurbishing the existing building stock. The energy savings had to amount to at least 25% for a comprehensive building refurbishment. Up to 25% of the loan amount could be converted to grant if it met certain conditions.
Credit lines	Bank lending windows for residential sector EE	The CO_2 Building Retrofitting Program of the German KfW was launched in 2001 to provide loans to building owners at subsidized interest rates: the higher the energy savings, the lower the interest rate. The program finances up to 100% of the investment costs, but not more than €250 per m^2.
Loan guarantees	Partial risk coverage for commercial bank loans to households	BEEF (Bulgaria), a PPP, provides investment support for EE projects, including bank guarantees for private household loans.
Price reform	Conversion from lump-sum to consumption-based billing	Price reforms have been implemented in all new EU-MS including establishment of a Regulatory Agencies. Obligations are typically stated in the Energy Law and/or special Heat Law.
Fiscal mechanisms		
Carbon, energy, environmental tax	Special tax on the production of GHGs, consumption of fuel, or harmful emissions	Most countries have taxes on certain fuels, which encourages reduced consumption. EE measures support the reduction of CO_2 production and harmful emissions.
Tax rebate	Reduced VAT or tax credit for purchase of certain efficient appliances	In France, ADEME developed a program for efficient wood stoves, using two mechanisms: the French General Tax Code allowed energy-saving equipment and RE production equipment to benefit from exceptional depreciation or accelerated digressive depreciation.
Delivery mechanisms		
Technical assistance	TA to help HOAs understand, be motivated, and implement EE measures	IFI- or government-financed programs usually include a TA component for EE awareness and information, project identification, development, and implementation. EE agencies can also offer some technical support.
Audits	Energy audits identify potential EE measures and assess savings potential	Many programs require an ex-ante energy audit. The Polish THERMO modernization Program used to demand a building audit to verify the minimum energy savings of 20%.
ESCOs, third-party financing	Third-party financing/ESCO allows users to repay investment costs from energy savings	There are very few ESCO examples in the residential sector in the region. In Croatia, ESCOs are being fostered through a governmental agency. The program addresses particularly construction companies, which have to contribute at least 10% to the investment costs, while the rest is covered by preferential loans.

Mechanism	Description	Example
On-bill financing	Utilities finance EE measures, which are paid back through the customers utility bills	On-bill programs have been piloted as early as 1993 (New London Resource Project, Wisconsin), but have recently seen a surge in popularity in the US. Utilities pre-finance EE investment and after implementation customers have to pay back the costs through the utility bill from the reduced energy costs. The main advantage is a reduction or elimination of first cost barrier, while generating immediate positive cash flows for consumers.
Bulk purchase	Purchasing efficient products in bulk to achieve lower prices	The US organization Transition Linlithgow is a community pioneering this approach. In 2011 it installed solar water heaters in 120 homes, with a further 80 projected for the remainder of the year. Cooperatives benefit from bulk purchase agreements too; in Denmark, many DH companies are owned by cooperatives.
Utility obligations	Energy suppliers obliged to save energy among customer base through EE and RE measures	France and the UK have used White Certificates and Energy Efficiency Certificates, respectively. Under both approaches, energy suppliers have an obligation to achieve a certain level of energy savings, with standardized eligible EE measures. In the UK this program is confined to the residential sector. In both countries, energy suppliers have to pay penalties in case they do not achieve this level. A recent Polish variant of the supplier obligation scheme includes DH companies.
Levies	Levies on consumption or production to create a fund for incentive schemes	In many countries, special surcharges are added to the electricity tariff to finance feed-in tariffs for electricity production with RE or support EE funds. In Germany, this surcharge amounts currently to 6.14 € ct/kWh.
Minimum standards	Minimum appliance standards remove low performance products from market	Building codes stipulate minimum requirements for heat losses in buildings. EE labeling and minimum standards for household appliances help shift the market to higher efficiency products.
EE funds (incl. revolving funds)	Funds that can provide incentives, loans or both for EE projects	BEEF (Bulgaria), the ECO Fund (Slovenia), and the R2E2 Fund (Armenia) all provide loans, TA and other support for EE investments in the public and residential sectors. Montenegro also has an environmental fund that can support EE projects.
Voluntary agreements	Companies (including utilities) commit themselves to nonbinding EE targets	Voluntary financial contributions were made by energy suppliers to enable the extension of projects delivering EE gains for low-income housing in Ireland in 2009. A significant proportion of these funds aimed to be spent through SEI's (National Energy Agency) Warmer Homes Scheme, delivering a range of efficient technologies to improve the energy performance of low-income households. Benefits from this scheme included reductions in energy bills (in some cases up to 50%).
Non-financial incentives	Noncash or fiscal incentives to invest in EE.	The city of Prague launched a program for retrofitting of the housing stock. The city created the Housing Economy Company, whose objective was to retrofit all the residential multifamily buildings belonging previously to the city. The Company has developed the standardized procedure for adding one or two floors. The company pre-finances the investment costs and received the return from investment from the sale of the new dwellings or additional rents created by new tenants. Other cities have adopted faster permitting for Green Buildings (Chicago) and allowances for higher buildings (Seattle).
Institutional mechanisms		
EE agency	Government entity focal point for EE programs and TA	Although EE agencies exist in all EU-MS and some exist in the Western Balkans, the impact of the latter is often small due to poor financial endowment and staffing.
Energy regulator	Independent entity determines rules for setting cost-covering tariffs and consumption-based billing	Energy regulators in the new EU-MS are in charge of power and DH. In Serbia and BiH, responsibility has been given to municipalities without having national rules for tariff-setting in the sector.


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