

## Case Study 23

# KredEx. Energy Efficiency Competence Centre

## Estonia



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**Energy behavioral changes**



## Changing Behaviour



Work package 2

Development of the conceptual model: Analysis of success factors, underlying models and methods in target group interaction

### Case Study 23:

KredEx. Energy Efficiency Competence Centre,  
Estonia

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## Summary of the case

KredEx - *Estonian Credit and Guarantee Fund*, was established in 2001 by the Ministry of Economic Affairs and Communications with a purpose to improve the financing opportunities of small and medium-sized companies, manage credit risks connected with export, enable people to build or renovate a home, apartment house and develop energy-saving way of thinking, thus change their behavioural habits towards improved energy efficiency. The mission of KredEx is manifold and relies on public interest:

- Increasing of the competitive strength of Estonian companies, improving the availability of financing and decreasing credit risks;
- Improving of the housing conditions of Estonian inhabitants, expanding financing opportunities and developing energy-saving way of thinking.

In general, KredEx offers financial solutions, which are based on the best practices of the world to achieve the abovementioned goals. KredEx is created to significantly decrease market failures regarding the services that organizations active in the private market do not wish to offer yet due to small market share, low profitability or other reasons, but which are still necessary, considering the development of Estonian economy or improving the quality of life of population. The purpose of KredEx is to serve the interests of the Estonian society as a whole.

KredEx has three departments; Marketing and product developing, Risk management and Finance & IT departments. It also has three divisions; Enterprise and export, Housing, and Energy Efficiency Consulting Centre (ESK). Two latter units are directly dealing with energy efficiency issues in housing sector we will be studying in present case study overview.

The Energy Efficiency Consulting Centre (ESK, in local language - *Energiasäästu Kompetentsi-keskus*) is a specific programme of its' kind, what has been created inside of KredEx with the aim to help housing associations to improve their energy efficiency performance. The direct target is, to reach, in fact, the real energy savings in block houses, to improve the quality and comfort of the inhabitants' living environment. The indirect aim is to save local fuels and thus also mitigate the climate warming. Saving fuel in heating sector allows combat climate change through reduction of CO<sub>2</sub> emissions. Programme is also oriented to reduce the resource consumption, promote sustainable lifestyles through enhanced awareness on energy saving and –efficiency. ESK was founded in January 2007 only on the initiative of Estonian Credit and Guarantee Fund KredEx. All activities of ESK are carried out in the frame of KredEx activities therefore the general characterization of KredEx is also relevant in case of its housing and consulting centre activities.

KredEx is an independent organization acting as provider of financing services and services mitigating financial risks. It also serves as an administrator of information regarding energy efficiency for apartment buildings and more extensively all inhabitants of Estonia, and a coordinator and implementer of activities on that matter. The purpose of KredEx is to offer solutions for eliminating the constraints and barriers of solutions, which have great importance for the society in cooperation and in accordance with other stakeholders acting in the same field of activity. The task of KredEx and ESK is offering of solutions based on strengths of all interested parties, coordinating the respective development activities and offering support to the possible extent most of all through state guarantees, as well as knowledge and skills.

In the frame of present case study a complex refurbishment project of an apartment house in Estonia will be described. This project was carried out in the bigger project *BEEN* - Baltic Energy Efficiency Network for the building stock project within the framework of the European Union programme INTERREG IIIB. The duration of the project was from the mid of 2005 until the end of 2007. From the Baltic Sea Region there were five European Union member states involved: Germany, Poland, Estonia, Latvia, Lithuania plus Russia and Byelorussia.

## Step 1: Context of the programme

### *National context*

As for the national context it could be said Estonia relies on heavily polluting oil shale combustion in two big power plants on eastern border of the country. It is a very specific feature of the energy sector that the production of electricity is based mostly on domestic fuel – oil shale. This causes over 80% of CO<sub>2</sub> emissions to atmosphere. Every megawatt-hour of electricity produced based on oil shale releases approximately 1.1 tonnes of CO<sub>2</sub>. This indicator exceeds significantly relevant indicators of EU 15 countries where the relevant numerical values are counted almost double less. Production of oil shale-based electricity covers Estonia's electricity consumption and also enables the export of electricity. In heat production the share of oil shale while not dominant but is still remarkable – in 2005 nearly 21% of heat (produced in power plants and boiler houses) was produced from oil shale. In general it could be said that Estonia is an *oil shale country*. This in its turn emphasize on importance of energy saving and energy efficiency as the carbon emission factor is very high and with every megawatt-hour energy produced based on oil shale, comparatively big amounts of greenhouse gases will be released to atmosphere. In context of changing the way of thinking and behaviour of all energy consumers, this fact has high priority meaning. Spending one kilowatt-hour of electricity in household or anywhere else means firing of one kilogram of oil shale.

The oil shale-based energy complex is concentrated into the North-East region of Estonia (*Ida-Viru County*) because of the location of oil shale deposits. It was founded in the 1950s to cover demand for electricity in Estonia as well in the North-Western region of the former Soviet Union. Several oil-shale mines and quarries started working and two large oil-shale power plants (*Balti PP* and *Eesti PP*) were built, which enabled in the 1980s to extract 25-30 million tonnes of oil shale and produce electricity in the amount of 17-19 TWh, of which 50-60% was exported to other regions of the Soviet Union. After regaining independence in 1991, the large and inefficient Soviet oil-shale energy complex was not suited to the new conditions of the Estonian economy. The production and consumption of electricity started to decrease in Estonian Republic. The decline was a consequence of general structural changes in the economy combined with the decline of industrial and agricultural production in Estonia and the decline in electricity exports. Analysis of the dynamics of final inland consumption of electricity indicates that the remarkable decrease continued until 1993 after which demand stabilised and since 1996, the consumption of electricity has increased slightly. Currently annual gross electricity generation has stabilised at around 10 TWh with final inland consumption on the level of 6.5–7 TWh. However, oil shale remains dominant in electricity production, having dropped only from 95-97% in the 1990s to 91-94% in the 2000s.

Key to decrease the emissions of greenhouse gases to atmosphere is in restructuring of power generation sector, and also, in demand side management (DSM), increasing energy efficiency, energy conservation, etc. In the following the demand side management issues will be characterised only.

Estonia has actively adopted EU regulations in energy sector starting its' membership in EU since May 2004. Based on the Directive 2002/91/EC of the European Parliament and the Council of 16 December 2002 on the energy performance of buildings, Estonia has the obligation to develop and implement measures to make the use of energy more efficient in existing buildings by the end of 2009. Also, the Directive 2006/32/EC of the European Parliament and the Council on the efficiency of final consumption of energy and energy services, what has been enforced in May 2006, is being adapted since present year, 2008.

Estonian Government is interested in higher efficiency as country belongs to group of member states with highest energy consumption per capita as for goods and services. The energy conservation potential is assessed to be relatively very high (up to 30%) compared to EU 15. Therefore, government makes effort to decrease the energy consumption in various sectors of national economy. Several energy conservation programmes have been initiated; Energy Conservation Targeted Programme in 1999, Renewable energy wider deployment overview from Renewable Energy Commission – “On the situation and use of renewable

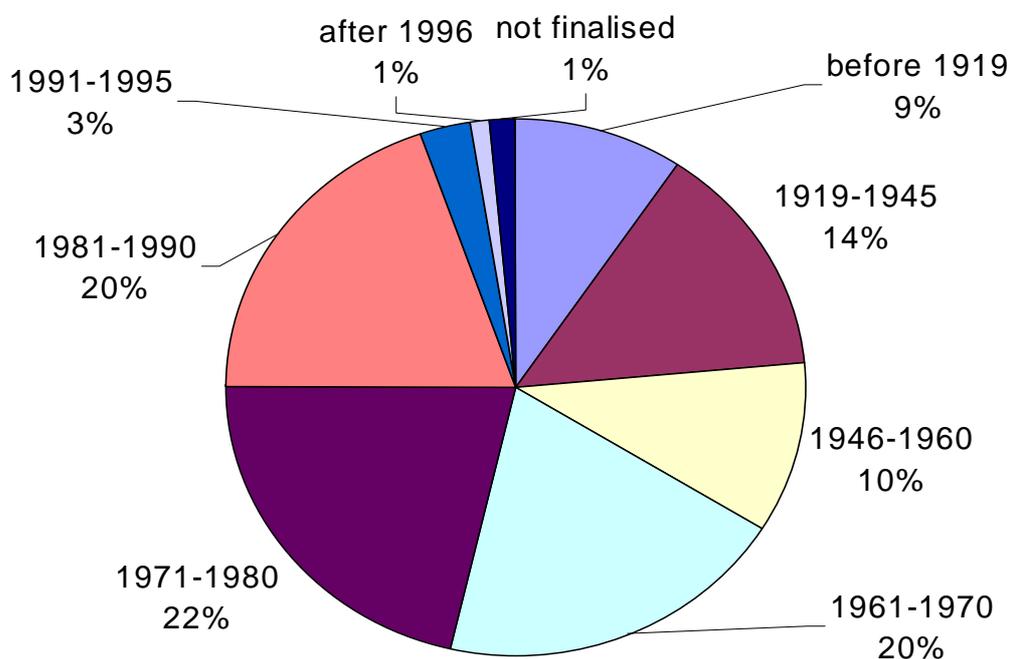
energy sources” in 2001<sup>1</sup>, Long-term Public Fuel and Energy Sector Development Plan until 2015<sup>2</sup> and the latest - the Energy Conservation Targeted Programme of 2007<sup>3</sup>.

The KredEx based Energy Efficiency Competence Centre is built up nation-wide, in fact there is no local context in a geographical sense (even though many of the participants are located in the Tallinn City and bordering county Harjumaa).

### Specific context

The *specific context* of The Energy Efficiency Competence Centre relates to the context in which housing sector and economy in general have the increasingly growing challenge to save energy as the energy prices have increased very rapidly bringing with a increased costs to all energy consumers. Thus, the widest interest group of this programme dealing with energy efficiency, could be named all population of the country. In more defined sense the housing sector and offices are included to major target group. Every citizen starts thinking about the energy prices when the heating or electricity bills become much higher compared to previous years.

The housing stock in Estonia is built mostly before the era of “energy efficiency”, when no special attention was paid to thermal isolation of multi-storey apartment houses. In the housing stock 14% are the buildings from period 1919- 1945, 10% - 1946-1960, 20% - 1961-1970, 22% - 1971-1980, 20% - 1981-1990, 3% 1991-1995 and 2% only after 1996 up till present time, see Figure 1. Thus, the stock in great majority (72%) consists of buildings from the period of centrally planned economy in Estonia when energy costs were subsidized by central government and did not reflect the real price. In comparison to wages (income) the heat and electricity costs were negligibly small compared to nowadays price. Low price was the main factor, which did not give right signal to consumers towards overall energy efficiency or saving.



**Figure 1. Housing Stock by year of completion**

Source: The Ministry of Economic Affairs and Communications.

<sup>1</sup> Taastuvenergiaallikate majanduslikult põhjendatud rakendamine energia tootmiseks. Majandus- ja Kommunikatsiooniministeerium, Tallinn, 2001.

<sup>2</sup> Long-term Public Fuel and Energy Sector Development Plan until 2015. 2004. *Riigi Teataja* (State Gazette). Vol. I, No. 88, 601.

<sup>3</sup> Energiasäästu sihtprogramm 2007 – 2013. National Energy Efficiency Action Plan (NEEAP) 2007-2013. Majandus- ja Kommunikatsiooniministeerium, The Ministry of Economic Affairs and Communications. Tallinn, 2007.

The housing division in KredEx and the Energy Efficiency Competence Centre, ESK in KredEx are involved to energy conservation and –efficiency issues. The ESK was created in frame of KredEx to reach the overall targets set by governmental programmes towards energy efficiency and -conservation. ESK was founded by in co-operation with the Ministry of Economic Affairs and Communications. The ESK activities are provided nation-wide, so there is no specific local context in a geographical sense.

The Energy Efficiency Competence Centre is financed on funding basically from two sources – the Estonian Ministry of Economics and Communications, and the European Regional Development Fund - ERDF (for the years 2007-2013). In addition the co-financing from different EC projects amplifies the financial support from state budget.

ESK is in fact, a small unit having two employees only. The small scope of the programme sets the limits to the range of topics it can currently cover. There is an obvious need to enhance the range of topics to be handled, however, the budget constraints do not allow involve more experts and widen the scope of interests at present.

The target group of KredEx based ESK includes wide range of housing sector, however, the main emphasis is on low energy efficiency block houses built in 1960—1990. This period in construction sector could be characterized with voluminous amounts of new living space. As the fuel prices were heavily subsidized in former Soviet system, no attention was paid to energy efficiency. This emphasized the attitude to isolation of buildings. It has been on very low level. Target group also includes schools, public sector buildings and building sector. Different target groups have different barriers to change their behaviour, also different economic and technological barriers exist to adopt the new technologies. Designing the complex of measures for each target group requires detailed approach to each of them. ESK is preparing the variety of programs, what are modified according to the target group specifics.

The way of working is organizing info-seminars, information dissemination via publishing leaflets and brochures, consulting housing associations in house renovation know-how introducing new concepts and technologies including energy efficiency and energy saving.

## Step 2: The focus of the programme

### *General issues, initiator and problem definition*

KredEx, ESK is an ongoing programme, there is no fixed duration. The funding for the years 2007-2013 is guaranteed, also the range of topics is, in fact, unlimited. KredEx was founded in 2001, ESK was launched by KredEx in 2006. There are total 26 employees in KredEx, two out of them only are engaged in ESK. There has no strictly fixed budget, the budget depends on the results of former years, also the funds receiveable from the European structural funds and from the government and state budget. KredEx among the first in Estonia was accredited as the user of European structural funds. The latter is a prerequisite for commissioning of the 643 million kroons that were meant for increasing the capital of KredEx in years 2007-2013 according to the approved programmes. In 2008 the foundation capital shall be increased by 230 million kroons. In energy conservation sector of the KredEx the loans for energy saving works of apartment buildings are based in particular on European structural funds.

Since 2003, KredEx has been awarded government grants for the purpose of financing reconstruction of apartment buildings and increasing the municipal rental housing fund. The conditions for receiving the grants have been established in the housing sector national action plan “*The development of the Estonian housing sector from 2003-2008*” and in the agreements signed between the Ministry of Economic Affairs and Communications and KredEx.

The programme has been initiated by the Ministry of Economic Affairs and Communications. Government has supported KredEx with seed money to start the first activities in 2001. Thereafter KredEx started to grow and earn income on their own. The Government has adopted several national targeted development plans on energy saving and conservation before creating KredEx in and The first National Energy Conservation Target Programme belongs to start-up years of independent Estonian Republic<sup>4</sup>, the next NEEAP has been a plan dated back to 2000<sup>5</sup> and involves the period 2000-2006. Traditionally the cost of energy in former Soviet Union was very low as it was generated by administrative methods, not based on market. This has caused formation of appropriate attitudes on demand side – no proper attention was paid prefabricated apartment houses thermal isolation issues, energy conservation and energy efficiency. Energy efficiency and -conservation has passed a long way to nowadays practices.

The purpose of the action plan “*Apartment building reconstruction*” project is to boost reconstruction of apartment buildings. The project targets apartment housing associations as well as associations of apartment owners. Within the framework of the project, target groups are granted non-returnable support for reconstruction and maintenance of apartment buildings, and provided with training and consulting in the field of reconstruction.

In 2007, for example, reconstruction grants were paid in the amount of 5,7 million kroons (16,6 million kroons in 2006, and building expertise grants in the amount of 4,4 million kroons (2,3 million kroons in 2006).

### *Goals and objectives*

KredEx helps companies grow. A company may lack guarantees or have a history too short to gain the trust of a bank. In that case it is possible to use loan guarantee, which considerably increases the possibilities of a company to obtain a loan from a bank.

Beside of energy efficiency issues KredEx offers export guarantees. It raises the competitiveness of exporters in Estonia. Depending on the buyer, the export guarantee of KredEx can be used to diminish a credit risks,

<sup>4</sup> Energiasäästu sihtprogramm. Energy Conservation Action Plan. Majandusministeerium, The Ministry of Economic Affairs and Communications Tallinn, 24. juuli 1992.

<sup>5</sup> Energiasäästu sihtprogramm (perioodiks 2000 – 2006). National Energy Efficiency Action Plan (NEEAP) for the period 2000-2006. Majandus-ja Kommunikatsiooniministeerium, The Ministry of Economic Affairs and Communications. Tallinn, 2000.

which makes it easier to offer goods or services on credit terms and ensures payment for the invoice regardless of the reasons of not receiving payment from the buyer. With the help of export guarantee a company has an opportunity to increase customer base, enter more risky markets and offer more flexible sales.

In housing sector KredEx improves the living environment, creating additional opportunities in solving financial issues connected with housing, and helping to preserve a good condition of existing buildings. KredEx offers;

- housing loan guarantee,
- loan guarantee for apartment building,
- grants for reconstruction of apartment buildings and procurement of housing facilities for local municipalities.

The ESK is active by KredEx, the purpose of which is to increase the awareness of energy saving of Estonian inhabitants and shape a suitable environment for improving the energy efficiency of buildings.

The overall assessment of the programme is an ambitious one and is continuously growing.

### *The targets and target group*

The target group is very wide, it could be said – all population of the country. The target groups could be enterprises, housing associations, private people, governmental institutions, etc. All groups which have realised the need for more deep knowledge in energy conservation and energy efficiency. Need to use rationally heat or electricity to save money or mitigate climate warming.

The Energy Efficiency Consulting Centre, ESK introduces the implementation of energy saving measures of mostly apartment buildings, manages all information on energy saving of apartment buildings and brings together different stakeholders on whom the future development of energy efficiency in Estonia depends. Also, the provision of information concerning the renovation and reconstruction of apartment buildings in connection with energy efficiency of apartment buildings is in focus.

The private house-owners have not been included to the frame of stakeholders at present time.

### Step 3: Design of programme

#### *What knowledge and ideas informed the design of the programme?*

KredEx and recently founded ESK are not based on any theoretical concept or DSM model, but have grown up from pragmatic approach towards energy efficiency raise in Estonia.

From year to year energy conservation and energy efficiency issues have received more attention in all sectors of national economy. In the former National Energy Conservation Target Programme, 2000<sup>6</sup>, the emphasis was put on demand side issues like the efficient management and rationalisation of heat and electricity consumption, adopting the European Commission's relevant directives on energy efficiency and energy saving, also, information dissemination in population and public sector. In the latest long term development plan, National Energy Efficiency Action Plan (NEEAP) 2007-2013<sup>7</sup> more emphasis is put on the implementation of European Union directives on energy conservation and –efficiency. The following directives could have more importance in current context - The Directive 2002/91/EC of the European Parliament and the Council of 16 December 2002 on the energy performance of buildings. This is being implemented for several years already. The Directive 2006/32/EC of the European Parliament and the Council on the efficiency of final consumption of energy and energy services – to be implemented in Estonia in 2008. Also, the renewable energy based electricity production directive has significant role to play in particular nowadays when imported fossil fuels has recently became political instrument. The Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market. The EU target - 5.1% share of RES-E based electricity consumption to year 2010 is fixed for Estonia. Administrative feed-in tariff approach was used to stimulate RES wider deployment.

#### *Research conducted on target group*

No specially designed research was performed beforehand for the programme in Estonia. However, major theoretical basis for the programme has been the study conducted in International Energy Agency on multi-storey apartment buildings refurbishment<sup>8</sup>. This research project, funded by the International Energy Agency and EuroACE (the European Alliance of Companies for Energy Efficiency in Buildings), investigates the potential for energy savings in highrise residential buildings in Europe defined by the 3rd European Housing Ministers. Conference on Sustainable Housing, in Genval, Belgium in 2002, as multi-family buildings with more than four storeys. It advocates the incorporation of energy efficiency improvements into widely needed overall refurbishment as a central element of sustainable refurbishment. The 28 countries covered by the project were organized into eight groups, according to socio-economic category (old EU members (EU15), new (EU10) and accession (AS3) states) and climate. Estonia belongs to so-called *cold climate group* of new Member States - Estonia, Latvia, Lithuania, Poland. Out of old Member States Austria, Denmark, Finland, Germany, Sweden belong to the same *cold climate group*.

The approaches presented there on the energy conservation and refurbishment of multi storey residences, and the target group issue in particular have been followed in the design of the programme in Estonia and the results were interpreted in local context. The results of the study were generalised and discussed in KredEx internally as well in common seminars with the target group representatives, i.e. Housing Association representatives, most active housing cooperatives' representative and the experts of Tallinn Technical university as well as the Ministry of Economic Affairs and Communications.

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<sup>6</sup> Ibid.

<sup>7</sup> Ibid.

<sup>8</sup> High Rise Refurbishment. The energy-efficient upgrade of multi-storey residences in the European Union. IEA information paper. OECD/IEA, Nov. 2006. Paris.

### *Barriers and risks*

In general it could be said that most buildings what are built before the “rebirth” of Estonian Republic in 1991 are more or less energy inefficient. According to the information from the Ministry of the Environment of Finland, Estonia uses two to three times more energy than the Nordic countries even though the average temperature is higher. This is well explained with the timely structure and characteristic of the housing stock what reflects to inefficient technology of construction of buildings (see Fig 1).

Based on the EU directive on energy efficiency for buildings, Estonia has the obligation to develop and implement measures to make the use of energy more efficient in existing buildings by the end of 2009. As a solution KredEx created in cooperation with the Ministry of Economic Affairs and Communications the Energy Efficiency Competence Centre, ESK. The goal was to share information related to the energy efficiency with residents of apartment building free of charge. Lack of appropriate information on refurbishment technologies, heating system optimisation and approaches to energy conservation has been one of the main barriers.

The Centre is supposed to encourage Estonians to improve the energy efficiency of their homes. ESK provides information on the implementation of energy efficiency measures for residents of apartment buildings; manages information concerning energy conservation and arranges meetings and seminars between various parties who play a role in Estonia in the further development of energy use in apartment buildings. The Centre also focuses on distributing information on renovation that saves energy and on structural repair of apartment buildings.

Still, the biggest barrier has been lack of sufficient financing for complex refurbishment works. Here KredEx started with different types of financial instruments to encourage housing associations to overcome these barriers with the help of seed financing.

### *Participation*

In the following the brief description of one success story – BEEN project, is introduced to use it for further explaining the present case study. Focus is on the carrying out of the BEEN model project in Estonia, familiarizing the doings of Estonian partners of BEEN, the reconstruction works and their financing.

BEEN or Baltic Energy Efficiency Network for the building stock project occurred within the framework of the European Union programme INTERREG IIIB. The duration of the project was 2.5 years, from July 2005 until December 2007. From the Baltic Sea Region there were five European Union member states involved: Germany, Poland, Estonia, Latvia, Lithuania plus Russia and Byelorussia. Altogether there were 26 partners included in the BEEN project, who are the representatives of important state levels and institutions and who are responsible for the energy efficient refurbishment in the residential areas of their state. There were 6 partners involved from Estonia: KredEx, Tallinn University of Technology (hereafter TTÜ), Estonian Union of Cooperative Housing Associations (hereafter EKÜL), Association of Estonian Facilities Administrators and Maintainers (hereafter EKHHL). Ministry of Economic Affairs and Communications of the Republic of Estonia Tallinn City Government (hereafter Tallinna LV). BEEN project was financed in the range of 75% out of the European Union funds of the programme INTERREG IIIB.

### *BEEN project in Estonia. Brief description*

In May 2006 KredEx announced a competition to Estonian apartment buildings “*Turn your Apartment building More Energy Efficient*”. The main aim of the competition was to find one apartment building in Estonia that would be prepared to carry out complex reconstruction works in order to gain maximum energy efficiency. The reconstruction works on the winning apartment were supported by a grant within the framework of the BEEN project.

All the apartment buildings in Estonia, built between 1955–1990 that were either built of panels, made of blocks or stone, could participate in the competition. There had been no significant renovation or

reconstruction works carried out during the past 5 years. The owners of the apartments of the building had to be ready to invest in the reconstruction works (with the help of a bank loan, if needed) at least 5 million kroons, out of which the winning building was granted of 1 million kroons from the European Union INTERREG III B framework.

It would be important to gain at least 30% energy efficiency as the result of the refurbishing works. There were three applicants in the competitions. Out of the applications that were presented to the competition, the Estonian partners of the BEEN project selected the winner on their meeting that took place on June 20<sup>th</sup>, 2006. It was the Home Owners' Association of Paldiski Road 171, and the cooperation agreement was signed on September 4<sup>th</sup>, 2006. This apartment building was built in 1977 as a large-panel construction by Tallinna Majaehituskombinaat (Tallinn House-building plant). The apartment building that is situated in Õismäe, Tallinn is a typical flat-roofed 5-floor panel building with four stairways that has 60 apartments.

According to the contract the following works were to be carried out in the apartment building within the framework of the BEEN project in 2006–2007: the reconstruction works of the heating system, roof, fassade (together with glazing the balconies and loggias and replacing all the windows not yet replaced) and ventilation system, the aim of which is to gain maximum energy efficiency.

### *Commitment*

High level support was in place. The EU financing has been involved to this programme, e.g., European Union programme INTERREG IIIB. At local level the support was also, high level as it included the Ministry of Economic Affairs and Communications of the Republic of Estonia and Tallinn City Government. It followed the general direction described in present and former NEEAP.

In short, in this complex refurbishment project of an apartment house many-sided financial, know-how and organisational support has brought to a success.

### *Learning, communication and monitoring*

The aim of BEEN was to develop the technical, legal, institutional and financial strategies and instruments to improve the energy efficient refurbishing of the residential buildings in the Baltic Sea Region, focussing mainly on the multi-storey housing stock erected between years 1950–1990. Within the BEEN project there were three best practice projects carried out, including a model project of refurbishing of an apartment building.

The aim of the best practice project of a complex refurbishing of an apartment building carried out in Estonia was to gain maximum energy efficiency. It has been continuous learning process for all stakeholders, included residents, involved in the project. Using this example, it would be possible to refer in the future to a specific apartment building and the energy efficiency that resulted from the refurbishing, which in turn affects significantly the monthly costs of the residents, mostly reducing the heating expenses. KredEx was responsible for carrying out the Estonian best practice project.

Regular meetings of household association and project stakeholders took place. In the course of the refurbishment work a lot of issues had to be modified compared to initial plans.

To the end of the project also, a movie-clip was produced to cover the completion of the project, which can be used in the future as an introductory educational material. The clip is in three languages - Estonian, Russian and English. A separate report on the project was produced.

Continuous monitoring of the project financial, technical and construction aspects was conducted. Information dissemination in housing association was performed. The results of a contentment survey that

was carried out among the residents „*Changes in the Residential Environment: Buildings and Residents*” by TTU researchers<sup>9</sup>.

#### *Link to other programmes and policy*

A lot of information was gathered from other countries, which have proceeded the same type of complex refurbishing programmes. Also, the studies performed in European Union member states. Here once again the IEA/OECD study *High Rise Refurbishment. The energy-efficient upgrade of multi-storey residences in the European Union*<sup>10</sup> should be mentioned. In particular valuable were the experience and practical help of neighbouring Nordic countries Finland, Sweden and Denmark.

From the policy point of view the programme relied on several legal acts and regulations. *Building Act* passed 15 May 2002 (RT<sup>1</sup> I 2002, 47, 297), entered into force 1 January 2003, *Apartment Associations Act* passed 27 June 1995 (RT<sup>1</sup> I 1995, 61, 1025; consolidated text RT I 1999, 42, 498), entered into force 3 August 1995, amended by the following Acts: 15.05.2002 entered into force 01.01.2004 - RT I 2002, 47, 297; 15.11.2000 entered into force 29.11.2000 - RT I 2000, 88, 576.

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<sup>9</sup> Katrin Paadam, Liis Ojamäe. Residents' assessments on the changes of residential environment. INTERREG III B "Baltic Energy Efficiency Network for the Building Stock". Tallinn University of Technology School of Economics and Public Administration Department of Public Economy, Chair of Sociology KredEx. Tallinn, 2007.

<sup>10</sup> Ibid.

## **Step 4: process of programme**

### *Interaction between the different participants*

The BEEN project in fact merged perfectly well all the project participants. Everyone in a big team was interested to see the (positive!) outcome of the unique complex refurbishment project of an inefficient soviet type apartment house. Nowadays heat consumption monitoring equipment was installed and used for continuous monitoring of the in-door temperatures in every flat, also in corridors. This “technical innovation” in fact caused great interest of all members of the housing association. People started better to understand the real meaning of the energy efficiency and need for energy saving in everyday household management practise.

The partners from different institutions were of help to each other. Target group was keen to perform all the refurbishment works possibly high quality level. This in its’ turn elaborated to success of the project. Daily discussions between the project participants were helpful avoiding bigger misunderstandings in the course of refurbishment works. Nevertheless, it should be mentioned that the social pressure, in fact, could be felt inside the target group. In a number of cases the lack of adequate and timely information was suggested by the target group.

### *Reaction of the project manager to issues/problems*

The project general manager KreEx and it’s ESK did real good work for the smooth running of the project. The partners wanted to involve a project manager to carry out the reconstruction project successfully and to perform owner supervision while helping the association to order plans, select the builders sign the construction contracts and accept of the construction works. To find the project manager, KredEx received tenders from 5 building contractors. The partners chose OÜ Ehitusseire on their meeting in 2006 and Kredex signed a contract with OÜ Ehitusseire to act as a project manager and performer of owner supervision.

The basis for successful management could be considered detailed contracts with the project partners, also close contact with the housing association managing this apartment house on Pladiski Road 171.

## Step 5. Outcome of the process

### *Objectives/goals/outcomes/effectiveness*

Opinions of the residents concerning the results of the renovation are mainly positive, especially those concerning the aesthetics, living comfort (warm rooms) and expenses that correspond to the increase in living standards. The apartment owners appreciate highly the changes in the outer look of their building and the significantly improved heating system: adjustability according to the individual needs; it is hoped that the new system would be efficient and economical. Considering all the changes that were rated positively, it is presumed that also the market value of the apartments has increased. This understanding, however, has not increased the residents' housing mobility. The housing conditions of the residents have improved considerably – majority of apartment owners while assessing their living after complex refurbishment are on opinion that it is beautiful, clean, warm and safe now.

### *Social learning*

Target group, the apartment owners in housing association Paldiski Road 171 have passed the whole cycle of social learning. It has been many-sided experience. The target group is satisfied with the results and ready to wider disseminate their positive assessments on the project. The Energy Efficiency Consulting Centre, ESK has built up a number of seminars based on the learning process of this complex refurbishment project. Many housing associations being well comparable (representative) to Paldiski Road 171 under the consideration, have shown up will to follow their example to get general living conditions improved and heating costs down, in particular.

From the point of view of changing attitudes to energy efficiency and energy conservation the project allowed the target group, also – all other participants of the project, to learn information on energy efficiency in apartment houses, nowadays practices of isolation of prefabricated panel buildings, also, better understanding of rational use of energy in everyday household activities.

### *Follow-up of the programme*

A good example of follow-up of the BEEN project has been the meeting of participants (Third Baltic Energy Dialog in the frame of the INTERREG III BEEN project) from all involved countries; Estonia, Latvia, Lithuania, Germany and Poland in the form of international conference "*How to achieve changes in housing energy efficiency - How to achieve energy savings up to 30%?*" in Tallinn on May 29<sup>th</sup> to 30<sup>th</sup> 2008, see web-site: <http://www.fes.ee/index.php?lang=en>. The BEEN project participants, consultancy companies involved to project, local municipalities representatives gathered for two days follow-up learning activity. First part on both days it has been the traditional conference proceeded in the form of presentations from all countries of the region. In the afternoon session the work was organized in the form of so-called "World-cafe", see for more details about this type of brain-storming on the web-site: <http://www.theworldcafe.com/what.htm>. The EU project's SECURE experience was introduced to apply it on case of Estonia. It consisted from short presentations on given topics of energy efficiency and energy conservation. One out of many was the non-technical barriers in apartment buildings refurbishment process. The presentation on BEEN project's success case in Estonia has been presented by KredEx representative, the head of housing sector, Mrs Mirja Adler, see for details <http://www.fes.ee/index.php?id=1155>.

The afternoon of the second day of the conference was devoted to visits (short excursion trips) to selected sites to learn best practices in energy saving on the example of apartment building sample reconstruction site on Paldiski Road 171, and the another - use of municipal waste based biogas plant in Tallinn city. Also, the movie clip produced by KredEx, ESK on this project was demonstrated to the participants of the BEEN network participants from Baltic Sea region countries. The complex refurbishment project was acknowledged as the best sample project carried out within the BEEN.

After accomplishment of the apartment building complex refurbishment project the results of a contentment survey “*Changes in the Residential Environment: Buildings and Residents*” was carried out among the residents of the apartment building Paldiski Road 171 by TTU researchers in 2007. The aim of the research project was to analyze residents’ assessments on the renovation works of their flats as well as the changes in their attitudes<sup>11</sup>.

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<sup>11</sup> Ibid.

## Step 6: analysis and conclusions

A number of conclusions and most crucial factors in the context of focus, design and/or process of KredEx, ESK can be made:

- Positive assessments to the results of the programme in whole and the discussed complex refurbishment project in particular, allow presume that the residential identity of the people would extend to the wider level and would form a solid basis to the formation of sustainable individual and collective housing strategies.
- The programme is also oriented to promote sustainable lifestyles through enhanced awareness of on energy saving and –efficiency.
- The KredEx, ESK programme have smoothly merged with existing performance management and evaluation systems in the participating organizations. There has been good communication between the projects' participants and the programme managers.
- As the living standard in country is still relatively low, seed money in the form of grants from government and EU structural funds is a factor, which could trigger massive programme of refurbishment of multi-storey apartment houses. KredEx and European Union financial support has been deciding factor, which made the start for relatively voluminous apartment houses refurbishment programme possible.
- Main intermediary organization The Energy Efficiency Competence Centre, ESK has been created with the aim to help housing associations to improve their energy efficiency performance. It has significantly elaborated towards the overall goal set up by the Government' strategic plan NEEAP, also, Housing Sector Development Plan and Operational Programme for the Development of the Living Environment. It could be said without the governmental support the programme of refurbishment of apartment houses would not happen. The housing associations in general are rather heterogeneous, thus not able to start costly and sophisticated enough complex renovation projects on their own.
- As for the particular INTERREG III B “Baltic Energy Efficiency Network for the Building Stock” BEEN project, one could differ direct and indirect results of the project. The direct results are the real energy savings in multi-storey apartment houses the improved living environment of the residents, apartment owners. This includes those concerning the aesthetics values as the changes in the outer look of their building, and general significantly raised living comfort (stabilized/balanced indoor temperature of apartments). The significantly improved heating system, which became adjustable according to the individual needs of apartment owners, is highly appreciated by residents. They well understand and appreciate that the upgraded heating system would be of much higher efficiency and thus the costs for heat will be significantly decreased.
- The indirect result occurs via saving of fuels needed for heat generation. Saving fuel in heating sector allows to combat climate change through reduction of CO<sub>2</sub> emissions. Saving electricity was less emphasized in the project, however, the real results of electricity savings took place as well. Thus the indirect goal what has been reached was to reduce the resource consumption and mitigate the climate warming.
- Opinions of the residents concerning the results of the renovation have been mainly positive. Considering all the changes that were rated positively, it is presumed that also the market value of the apartments has increased. This understanding, however, has not increased the residents' housing mobility. The housing conditions of the residents have improved considerably – majority of apartment owners while assessing their living after complex refurbishment are on opinion that it is beautiful, clean, warm and safe now.
- In addition to financial payback and reduced CO<sub>2</sub> emissions, the less tangible benefits of improved energy security in terms of avoided investment in energy generation and distribution, increased system reliability and resource conservation took place.