

2008

Pre-feasibility study on promoting energy efficiency in public buildings



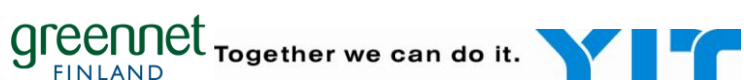
Green Net Finland ry

YIT Kiinteistötekniikka Oy

30.6.2008

Pre-feasibility study on promoting energy efficiency in public buildings

Angelica Roschier, Anu Hassinen, Karoliina Saarniaho



This report was prepared within a project funded by the Uusimaa Regional Council, Vantaa City, YIT Kiinteistötekniikka Oy and Green Net Finland ry. The project steering committee included the following members: Kalevi Hyvärinen (YIT Kiinteistötekniikka Oy), Marja-Leena Sipilä (Uusimaa Regional Council), Pasi Salo and Raimo Koskenkanto (Vantaa City) and Lauri Hietaniemi (Green Net Finland).

**Green Net Finland ry
Vantaa 2008**

CONTENT

1	Executive Summary	1
2	Introduction	2
3	Background, objective and activities of the pre-feasibility study	2
3.1	Project background	2
3.2	Project objective	3
3.3	Project activities.....	4
3.3.1	The implementation of the project activities.....	4
4	Results of the audits	6
5	Using ESCO, EPC and PPP contracts in implementing energy efficiency investments	12
5.1	The ESCO concept	13
5.1.1	How does the ESCO work?	13
5.1.2	A basic ESCO project	14
5.1.3	ESCO as part of a renovation project.....	15
5.1.4	ESCO as part of a construction project	16
5.2	The EPC model	16
5.2.1	The EPC process.....	16
5.3	Public-private-partnership (PPP) model.....	18
5.4	Assessment of potential to use ESCO/EPC/PPP models in public building sector of Kaunas	21
5.5	ESCOs in Lithuania.....	23
6	Other possible financing sources	23
6.1	EU Structural Funds.....	23
6.2	Lithuanian Environmental Investment Fund (LEIF)	24
6.3	Green Investment Schemes and other possible future investment mechanisms	26
6.4	Summary of funds used in recent years	26
6.5	Fiscal measures.....	28
7	Possible areas and partners for further co-operation with Kaunas	28
7.1	LEI	29
7.2	KREA	30
7.3	KTU Apini	31
8	Conclusions and recommendations	31
	References.....	33
	Annex 1. Overview of legal and institutional measures to support EE investments in Lithuania	34
	Annex 2. Energy Inspection Report of Linelis (Kaunas) Kindergarten.....	38
	Annex 3. Energy Inspection Report of Ausrine (Kaunas) Kindergarten.....	48
	Annex 4. Energy Inspection Report of Purienu (Kaunas) Secondary School.....	59
	Annex 5. Energy Inspection Report of Vyduno (Kaunas) Secondary School.....	70
	Annex 6. Energy Inspection Report of Girinukas (Kaunas) Kindergarten.....	83
	Annex 7. Energy Inspection Report of Petراسiunai (Kaunas) Secondary School.....	93

1 Executive Summary

The objective of this pre-feasibility study was to provide information on most cost-effective measures to improve energy efficiency in public buildings of Kaunas and Vantaa cities and identify possible sources of financing for the implementation of the proposed measures. The project consortium included representatives from YIT Kiinteistötekniikka, YIT Technika, Green Net Finland, Kaunas municipality, Kauno Energija and City of Vantaa. The Uusimaa Regional Council and the City of Vantaa provided funding for the project.

Project activities included data gathering, audits and on-site visits in Kaunas to get a general picture of the present state of the energy performance of the public building stock. Based on the initial data gathering, the project was further defined to focus on educational buildings that represent the largest homogenous group of public buildings in Kaunas. As a result of the energy audits conducted in three schools and three kindergartens, measures to improve their energy performance were identified. The findings are summarized in this report and presented in more detail in the annex for each individual building.

Possible financing models and sources of financing for the necessary investments were also evaluated, with special attention paid to the ESCO, EPC and PPP models and their applicability for the target buildings.

As part of the project, the City of Vantaa was also interested in learning more of potential application of the ESCO and EPC models. This exchange of information between Vantaa and YIT will further continue after the project ends.

The general outcome of the project was that, at current situation, the typical ESCO and EPC models are not feasible in Kaunas due to the poor overall condition of the buildings. Public-private partnership (PPP) is probably the most cost-effective way to enhance the overall condition of the buildings, after which also ESCO and EPC models can be used more effectively.

Concrete possibilities for improving energy efficiency in schools and kindergartens in Kaunas include further development of ESCO and PPP concepts suitable for the local needs and better utilization of the available funding from soft loans and funds, such as Lithuanian Environmental Investment Fund. One option for the development is closer cooperation with the providers of the building and maintenance services. As the construction of the new buildings slows down, the interest of the companies to develop new renovation concepts is also likely to increase. Life-cycle cost analysis should be implemented always when considering the renovation of the buildings – proper analysis often justifies higher initial investment costs if the maintenance costs can be reduced in return, resulting in overall savings during the life cycle of the building. The improvement of overall indoor air quality should be one of the main goals when designing renovation projects, especially in the educational sector.

In order to further remove the barriers for implementing and financing energy efficiency projects within the public buildings in Kaunas and Lithuania, best practices learned from already implemented EU projects should also be applied and tailored to local conditions.

2 Introduction

In January 2007, Green Net Finland visited Kaunas Municipality within the FENEX Project in order to identify new co-operation areas for its members. Green Net Finland had already been participating with Kauno Energija in the implementation of the ESCOBALT Project as a subcontractor for Vantaa Energy. During the visit, the Kaunas representatives expressed an interest to familiarize with the Uusimaa Region's energy efficiency solutions and, therefore, Green Net organized a visit to Uusimaa Region by the Director of the Kaunas City Administration and the Head of strategy department of Kauno Energija in summer 2007.

During the visit in summer 2007, the Kaunas representatives met with Vantaa Energy, Motiva, VTT and YIT. Particular interest was shown on the presentation of the ESCO Concept in improving the energy efficiency in Finnish cities by YIT. The Kaunas city representatives expressed their willingness to utilize the expertise of YIT in auditing the public buildings in Kaunas and making recommendations on energy efficiency improvements. It was agreed that the parties will seek for various financing sources for such activities. As YIT is already a market leader on the construction business in Lithuania, it was seen to have excellent references to carry out the work. The Kaunas representatives were also interested in learning from the experience of Vantaa Municipality on how to organize its real estate management. Other areas of interest were district heating and cooling expertise from the Helsinki Metropolitan area. It was also agreed that Kaunas Energija will identify joint project ideas for Green Net Finland on behalf of Kaunas municipality. After identification, the projects can be developed jointly.

A co-operation agreement between Green Net Finland and Kauno Energija was signed after the meeting, and this project is one of the first steps to implement that agreement. The project was implemented by a partnership between Green Net Finland and YIT Kiinteistötekniikka Oy and co-funded by the Uusimaa Regional Council as well as the City of Vantaa.

During the project, the Kaunas representatives have emphasized that there is a strong need to find solutions to improve the energy efficiency of public buildings, especially on the educational sector which uses around 60 per cent of the municipal budget. In total, the public buildings (schools, kindergartens, hospitals, government institutions, etc.) consume about 180 kWh/m² annually. With the rising energy prices, especially gas prices, there are more incentives to save energy. The EU legislation is also a strong driver for improving energy efficiency and the new City Mayor has been actively supporting ideas on this area. The Kaunas city representatives stated that according to their opinion, public-private co-operation is the most effective way of getting results.

3 Background, objective and activities of the pre-feasibility study

3.1 Project background

Kaunas with its nearly 400 thousand inhabitants is the second largest Lithuanian city and an important centre for business, industry and research. The problems related to deteriorating Soviet era building stock, especially on public sector buildings, are common to many other former Eastern bloc countries. Over 95 %

of the building stock has been built before 1992, when very low requirements for thermal resistance of buildings were in force due to relatively abundant energy reserves of the Soviet Union, resulting in very poor energy performance. Most of the public buildings in Kaunas are connected to district heating but the prevailing one-pipe radiator system and lack of heating sub-stations make apartment-based temperature control and measurement of heat and hot water consumption very difficult. Lithuania is still dependent on import of primary energy resources from Russia, mainly in the form of natural gas. Rising energy prices have caused an urgent need for improving the energy efficiency of building stock.

According to the EU Directive (2002/91/EC) on the energy performance of buildings (EPBD) the Member States must apply minimum requirements as regards the energy performance of new and existing buildings, ensure the certification of their energy performance and require the regular inspection of boilers and air conditioning systems in buildings. The Directive concerns the residential sector and the tertiary sector (offices, public buildings, etc.). Energy performance certificates should be made available when buildings are constructed, sold or rented out. The Directive specifically mentions rented buildings with the aim of ensuring that the owner, who does not normally pay the charges for energy expenditure, should take the necessary action. Furthermore, the Directive states that occupants of buildings should be enabled to regulate their own consumption of heat and hot water, in so far as such measures are cost-effective. The Member States are responsible for drawing up the minimum standards. They will also ensure that the certification and inspection of buildings are carried out by qualified and independent personnel. According to Lithuanian legislation, the energy performance class of new buildings (building part) should not be less than C and for existing buildings (of more than 1000 m²) after major renovation should not be less than D (on a scale of A-G). Certification requirements for existing and refurbished buildings will come into force from 1 January, 2009.

The second key EU legislation driving energy efficiency investments is the EU Directive (2006/32/EC) on Energy End Use Efficiency & Energy Services (ESD) that aims at enhancing the cost-effective improvement of energy end use efficiency in Member States. It allows for voluntary as well as legislative measures to be put in place and must be fully implemented by 17th May 2008. The directive sets a national indicative energy savings target of 9% by 2017, requires public sector to fulfill an exemplary role in the context of the Directive, requires Member States to place obligations on energy suppliers and distributors to promote energy efficiency and contains requirements on metering and billing to allow consumers to make better informed decisions about their energy use.

3.2 Project objective

The objective of the project was to provide information on most cost-effective measures to improve the energy efficiency in public buildings in Kaunas and Vantaa and suggest possible forms of financing for implementing the identified measures.

Based on this prefeasibility study, the plan was to prepare a project proposal for a larger (EU) project.

3.3 Project activities

The planned project activities were the following:

1. Data gathering and evaluation of the total public building stock (all the public buildings) in Kaunas regarding the use of electricity, heat and water and a targeted evaluation of energy efficiency in chosen types of public real estates in Vantaa for comparison.
2. On-site visits and targeted walk-through energy audits to 7-10 public buildings in Kaunas based on the results of the previous step.
3. Preparation and evaluation of the proposal for Energy Performance Contracting (EPC) contract model for public buildings or building stock.
4. Evaluation of the possibilities for financing the proposed energy efficiency investments in public buildings as well as networking and identification of potential partners for cooperation on a wider project.

3.3.1 The implementation of the project activities

At the start of the project the project scope was redefined to focus only the educational buildings of Kaunas Municipality. The educational building stock was chosen because the schools and kindergartens represent the largest homogenous group of buildings in Kaunas and the educational sector uses 60 per cent of the municipal budget. There are 137 educational buildings and the heating energy costs for them were nearly 3.8 million Euros in 2006.

The audits were carried out by YIT Technika in Lithuania during March and April 2008. The representatives of YIT Kiinteistötekniikka visited the sites at the end of April to reconfirm the findings and get an overview of the 6 audited sites. YIT Kiinteistötekniikka and YIT Technika were also in close co-operation during the auditing process.

To get a good overall understanding of the present status of the educational building stock in Kaunas, audits were carried out in three schools and three kindergartens. One school and one kindergarten were audited more thoroughly than originally planned while the rest were walk-through audited according to the original plan.

The audits included the following:

For the two extended audits:

- Measurement of heating load day curves;
- Measurement of temperatures in classrooms and other premises
- Measurement of temperatures of heating raisers and radiators
- Measurement of electricity load day curves

- Lighting load measurements
- Lighting level measurement at typical premises
- Measurements of other electrical loads when it is necessary (kitchen e.g.)
- Measurement data processing
- Audit findings
- Audit proposals for renovations.

For the walk-through audits:

- Measurement of temperatures of heating raisers and radiators at end points
- Other measurement on local findings
- Heat/electricity consumption data collection
- Current measurements at the main distribution board
- Lighting level measurement at typical premises
- Walk through findings and proposals.

As a result of the audit, an energy inspection report presenting the findings and proposed actions was written separately for each individual target building. The reports are attached to this report (see Annexes 2-7).

The audited sites were chosen by the Municipality of Kaunas in close discussion with representatives of YIT Technika. The chosen targets represent typical educational buildings in different conditions (poor-average-good).

The sites chosen for auditing were:

1. Kindergarten "Aušrine", 3008 Baltu pr.49
2. Kindergarten "Girinukas", 3009 Partizanu g.52
3. Kindergarten "Linelis", 3009 Savanoriu pr.236a
4. Kaunas Petrašiunai secondary school, 3014 M.Gimbutienės g.9
5. Kaunas "Purienu" secondary school, 3009 S.Ložoraicio g.13
6. Kaunas Vyduno secondary school, 3043 Šiaurės pr.57.

As part of the project activities, the Vantaa City was interested in having further information on the applicability of ESCO and EPC models in public buildings sector and wanted to have a deeper understanding of contractual issues of ESCO and EPC contracts.

4 Results of the audits

As a result of the audits, the following points were addressed:

- needed actions to increase the energy performance of the buildings
- a general view of the present situation of the building systems, and the technical and constructional level
- proposals for tools for improving the condition of the buildings.

When the audits were carried out, it became clear that the educational buildings of Kaunas lack modern building systems and are in need of constructional renovations. There is also a need to improve the indoor climate, when, for instance, the indoor temperatures in the buildings varied from 15 to 23 degrees at the time of the audits. Possible reasons for the temperature variation are poor insulation, single windows and the one-pipe-principle-based heat distribution system.

Although the audits were energy audits and not construction ones, basic constructional issues are presented in the audit reports as well as described in Table 1. This is because constructional issues relate to energy performance and when considering energy performance improvements it is usually more cost-efficient to implement them in connection with constructional renovation projects.

Table 1. Summary of proposed energy efficiency improvements

SUMMARY OF PROPOSED ACTIONS:			
Building/ Action proposal:	Investment cost:	Annual savings:	PBT:
Linelis kindergarten:			
Water saving inserts for taps	21 300 LTL	1 330 LTL	16 years
Renovation of heating centre and windows	155 880LTL	11 684 LTL	13,3 years
Ausrine kindergarten:			
Occupancy detectors for WC lighting	150 LTL	40,8 LTL	3,7 years
Water saving inserts for taps	19 500 LTL	1 820 LTL	10,7 years
Renovation of heating centre and windows	152 000 LTL	20 831 LTL	7,3 years

Girinukas kindergarten:			
Water saving inserts for taps	21 600 LTL	1 150 LTL	18,7 years
Petrasiunai secondary school:			
Water saving inserts for taps	3 900 LTL	2 050 LTL	1,9 years
Replacement of lighting fixtures/ sport hall	7 580 LTL	1 768 LTL	4,3 years
Replacement of lighting fixtures/ whole school	96 000 LTL	10 568 LTL	9,1 years
Renovation of heating centre and windows	467 400 LTL	34 847 LTL	13,4 years
Purienu secondary school:			
Water saving inserts for taps	14 700 LTL	1 090 LTL	13,5 years
Replacement of lighting fixtures/ sport hall	4 366 LTL	905 LTL	4,8 years
Replacement of lighting fixtures/ whole school	54 000 LTL	7 629 LTL	7,1 years
Vyduno secondary school:			
Water saving inserts for taps	14 700 LTL	1 090 LTL	13,5 years
Replacement of lighting fixtures/ sport hall	11 353 LTL	2 357 LTL	4,8 years
Replacement of lighting fixtures/ whole school	84 000 LTL	7 629 LTL	11 years
Renovation of heating centre and windows	547 000 LTL	33 999 LTL	16,1 years



Picture 1. The old heating centre of Petrašiunai secondary school. There might be asbestos findings when renovating the old heating centres and systems.



Picture 2. The renovated heating centre of Purienu secondary school

Table 2. Summary of constructional issues affecting energy efficiency

SUMMARY OF CONSTRUCTIONAL ISSUES AFFECTING ENERGY EFFICIENCY:	
Poor window insulation	<ul style="list-style-type: none"> • Ausrine kindergarten • Vyduno secondary school • Petراسiunai secondary school • Linelis kindergarten
Poor roof insulation	<ul style="list-style-type: none"> • Linelis kindergarten • Girinukas kindergarten

	<ul style="list-style-type: none"> • Purienu secondary school
Low quality doors	<ul style="list-style-type: none"> • Petrašiunai secondary school • Linelis kindergarten
Outdated heating system	<ul style="list-style-type: none"> • Ausrine kindergarten • Vyduno secondary school • Petrašiunai secondary school • Linelis kindergarten

The most common and severe constructional problems affecting the energy efficiency of the audited buildings were poor window insulation and the outdated heating system. Five of six audited buildings suffered from poor window insulation and four of six audited buildings had an outdated heating system. Poor roof insulation also proved to be a problem in three out of six buildings. In Purienu secondary school the roof had just been renovated, but the insulation had been compromised due to financial issues.



Picture 3. A window in Petrašiunai secondary school. The window does not close properly as can be seen in the picture.



Picture 4. Temporary window insulation made with tape.



Picture 5. Low quality doors in Vyduno secondary school affects the energy performance of the building and creates cold bridges.

In addition to the poor insulation situation, some moisture damages were found especially in Petrašiunai Secondary school as shown in Picture 6. In one of the kindergartens audited the foundation also proved to be severely damaged and in need of renovation or renewal. Mould findings are very probable and can have rather severe impact on the health of both personnel and children. Therefore, humidity and mould problems must be addressed as a priority investment to any energy performance issues.



Picture 6. A major moisture damage in the roof of Petrašiunai secondary school.

After the audits were completed, there have been some renovations in the target buildings - for example, the kindergarten “Aušrine” was partly renovated between the time of the audits in March 2008 and the visit by representatives for YIT Kiinteistötekniikka at the end of April. Because YIT Technika och YIT Kiinteistötekniikka were not informed by the Municipality of any renovations or changes, these results of these renovations are not considered in this report. This report is based on the actual status of the buildings at the time of the audits and neither the overall view of the building stock nor the conclusions of the report have been affected by the already implemented measures.

5 Using ESCO, EPC and PPP contracts in implementing energy efficiency investments

One aim of this pre-feasibility study was to present the ESCO and EPC models and make an assessment of their feasibility for improving the energy performance of public buildings in the current Lithuanian business and legal environment, taking into consideration the current state of the infrastructure.

5.1 The ESCO concept

The ESCO (*Energy Service Company*) concept is a tool for improving energy efficiency of, for example, an industrial process or a building, through a third party organization (a service company). The ESCO concept was developed in the United States due to the oil crises in the 1970s and early 1980s. The rapid increase of the price of oil-products led to a totally new need for energy conservation, and, therefore, a new market niche were opened and the ESCO concept was born to satisfy the needs of the markets.

Today, ESCO services account for a significant part of the energy conservation in the United States, especially in the public sector. For example, ESCO projects account for the majority of the energy saving investments in schools. In Europe, ESCO service market is still not generally as developed as in the United States, although a lot of effort has been made to promote the concept through legislative and financial mechanisms within the European Union.

5.1.1 How does the ESCO work?

In the ESCO model an external service provider (the ESCO company) handles the energy saving investment project of its client, managing the whole project and often arranging its financing as well, until the investment is paid back by accumulated savings.

Usually ESCO projects have an external financier who is involved contractually with either the ESCO or the customer. In order to secure the financing, the ESCO often gives a guarantee for the savings to be accumulated as a result of the investment. From the customer's point of view the investment costs are paid off (at least partially) to the financier by the accumulated energy savings.

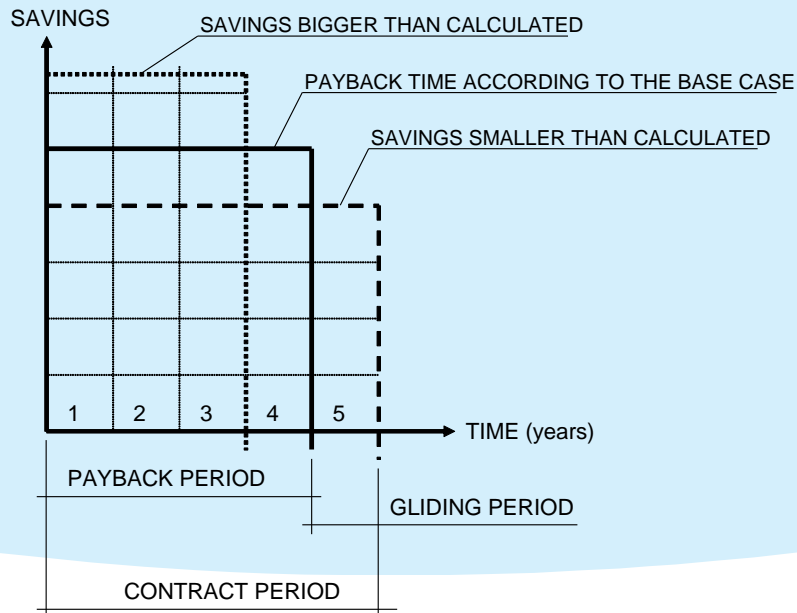
An ESCO project can, in its most simple form, be divided into four different phases: (1) the preliminary phase, (2) the design phase, (3) the implementation phase and (4) the follow-up and service phase.

In the preliminary or start-up phase, the energy saving potential is acknowledged, the project defined and the preliminary calculations are made. The most important objective of the preliminary phase is to agree on the terms of the project and sign the project contracts.

The design phase includes all detailed calculations and the design of the project plan for the implementation phase. In the implementation phase, all the installation and construction work of the project is done and the user training is completed. In the last phase of the project, the follow-up and service phase, the energy savings are monitored and verified.

In an ESCO project, the ESCO assumes the responsibility for the energy savings to be achieved. In the follow-up and service phase, these energy savings are verified and monitored. If the guaranteed energy savings are not achieved, the ESCO will compensate its client. This way, the ESCO carries the performance risk (and usually at least a part of the financial risk as well) instead of its client which is a very important aspect of the ESCO business.

Payback time as a function of the real savings



Together we can do it. **YIT**

25 June 2008 | YIT KIINTEISTÖTEKNIikka OY

Picture 7. An example of handling the amount of savings accumulated in the “open book” ESCO model. The gliding period is usually limited to 1 year.

5.1.2 A basic ESCO project

In its basic form, an ESCO project can be structured to implement any energy saving investment that is paid back by the accumulated savings. The basic logic is shown in picture 8.

Idea of ESCO- service



Together we can do it. **YIT**

19 June 2008 | YIT KIINTEISTÖTEKNIikka OY

Picture 8. The basic idea of an ESCO project.

The ESCO project can be financed in many different ways. Either the client or the ESCO can take responsibility for raising the funds needed, usually employing a loan or a leasing agreement. Often the ESCO arranges financing as part of the service, and the customer is left with just signing the contract. It is also possible for the ESCO and the client to finance the project together, especially if the project involves concurrent renovation work.

5.1.3 ESCO as part of a renovation project

The ESCO model can also be utilized as a part of a renovation project. In such a case the ESCO will only participate in the part of the project that improves the energy performance of the building. An add-on ESCO project can also be carried out to improve the solutions of an already planned renovation project.

For example, if the renovation project would concern installation of ventilation systems, the ESCO project could be about adding heat recovery to the ventilation system as part of the renovation.

In the Kaunas case, the ESCO model could have been used in the renovation project of the roof of a school that was renovated because of leaks but not insulated because of financial problems - it might have been possible to do the insulation as a renovation ESCO project.

It is also possible that a renovation ESCO will cover the difference between the installation cost of traditional equipment and energy efficient equipment.

5.1.4 ESCO as part of a construction project

An ESCO project as part of a construction project is very similar to renovation ESCO. Most ESCOs in construction projects concern investment upgrades to more energy efficient equipment, systems and processes. In this kind of an ESCO project, the ESCO project would cover the price difference between the originally planned investment and the more expensive, more energy efficient investment.

While it is most economical to take the energy performance issues into consideration already in the design and construction phase, rather than later on in the project life-cycle, the ESCO model can still be used to enhance the value of already planned projects.

5.2 The EPC model

EPC (Energy Performance Contracting) is closely related to the ESCO model. The distinction between the two is mostly related to the scope and complexity of the project. While the ESCO model can be used to implement any simple energy efficiency improvements, an EPC project normally includes multiple actions to improve the energy performance of its target building and also covers more than one building.

In Finland, the EPC projects usually involve about ten buildings and aim to increase their energy efficiency and technical level - sometimes also the constructional level, while in Sweden EPC projects can include as many as 50 buildings.

Because EPC projects concern many target buildings, the risk management of EPC projects differ from the ESCO model and it is possible to include a wider range of services in the project. The EPC projects always strive to motivate the users of the buildings to take part of the energy performance increase and education of the main users of the target buildings is one of the tasks included in an EPC project.

In EPC projects, because of their large size, it is possible to implement more than just basic energy efficiency investments. Typically, EPC projects also include renovation investments such as window changes, insulation improvements, heating system and automation modernizations, and modernizations of lighting fixtures and ventilation systems.

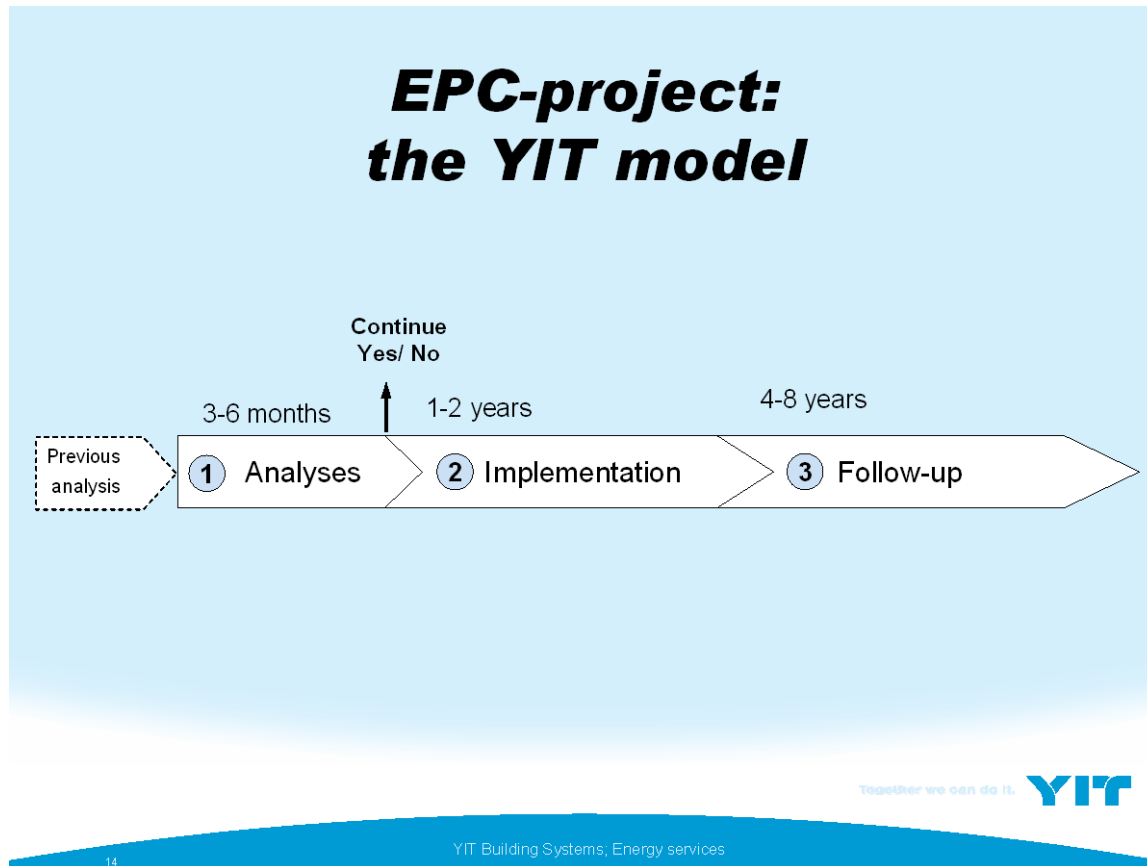
5.2.1 The EPC process

An EPC project starts with the analyses phase (phase 1), and continues with the implementation phase (phase 2) and the follow-up phase (phase 3). The pre-feasibility study, sometimes called phase 0, is also an important part the EPC project. In the pre-feasibility phase, the potential to start an EPC project is determined, based on previous analysis, energy consumption data and technical information.

The analyses phase includes all the needed measurements and studies for accurate calculations and financial analyses. After the analyses phase is completed, the EPC contract is agreed on and the implementation phase can begin. In the implementation phase, the project investments are completed

with all construction and installation work done. Also, the education for the main users is completed. After this, the follow-up and service part begins with monitoring the energy savings and optimizing the operational issues of the target building stock. This part focuses on the maintenance and continuous progress in the energy performance improvement.

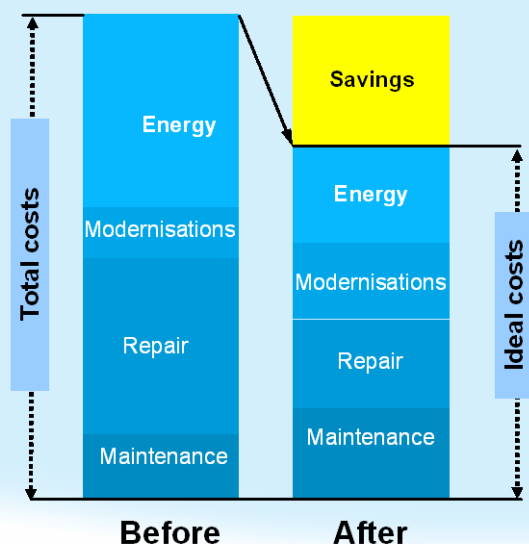
The simplified EPC process is shown in picture 9.



Picture 9. The basic process of an EPC project

EPC projects are mainly financed with the energy savings accumulated due to the project implementation and by the reduced repair costs due to the modernizations and the extended maintenance as shown in picture 10.

The financial logic behind EPC



Together we can do it. **YIT**

YIT Building Systems; Energy services

18

Picture 10. The logic behind the savings of an EPC project. When investing in modernisations and maintenance, the repair and energy costs decrease accumulating savings.

If there is a bigger need for renovation investments that the client would need to undertake outside the EPC project, these can be joined to the project but financed with a separate renovation loan or leasing agreement.

There are varieties of ways to finance the investments of an EPC project, but the typical options are:

- Bank loan
- Leasing agreement
- Self-financing.

5.3 Public-private-partnership (PPP) model

Private sector participation in public infrastructure investments is one alternative in financing bankable (i.e. economically feasible) projects. In Baltic countries, public-private partnership (PPP) models are commonly used in providing energy services on the supply side but are less common on the end-user (or demand-side) investments. In Lithuania, municipalities own about 57 per cent of district heating companies, 43 per cent

are leased. Dalkia Group (France) manage 9 utilities; “E energija” UAB (local investor) - 3 utilities and “Fortum Heat Lietuva” UAB (Finland) – 2 utilities.

International institutions, such as the European Bank for Reconstruction and Development (EBRD), have been actively supporting the development of PPP legislation in Baltic countries. The PPP legislation in Lithuania allows private and public entities to enter into PPPs in three main ways: 1) by undergoing a concession granting tender and subsequently concluding a concession agreement; 2) by undergoing public procurement procedures and concluding a procurement agreement; and 3) by concluding a civil law contract between the public and private partners. It is expected that the future PPP projects in Lithuania will be implemented by way of public procurement as the permitted length of the procurement contracts have been extended. Typical PPP arrangement is one where the municipality grants a concession (15-25 years) to a private sector investor who is responsible for the necessary investments as well as the operation and maintenance during the concession period. The private company usually pays an annual fixed fee for leasing the infrastructure to the municipality. After the concession period, the improved assets are transferred back to the ownership of municipality (if the ownership is transferred in the first place). The return for the private investor comes from the savings (energy and other) achieved as a result of the investments when the municipality normally also ends up paying a lower rate for the services that it would pay otherwise because of improved efficiency of private sector operator. The private partner is compensated either by collecting income from end-users of the infrastructure or by being paid a fixed amount by the public partners (or a combination of the two).

In Finland, PPP model has been used by City of Espoo in financing investments in public buildings, including schools and health care facilities. The cases cover design-build-operate-transfer (BOOT) contracts as well as design-renovate-operate-transfer (ROT) contracts.

The Kaivomestari project of the City of Espoo is a pilot PPP project in Finland and it covers the designing, building, operating and maintaining of a school, a sports hall and a swimming pool. The concession agreement for 25 years came into force on July 2003. The partners of the Kaivomestari project are the project company Arandur Oy and the City of Espoo. Arandur Oy was founded by the private actors of the project with its only aim to be a project organization for this PPP project - this way the City of Espoo only faces one contract partner. Arandur Oy can also purchase services from other private actors than its owners. According to the concession agreement, Arandur Oy produces all the facilities and services for its client (the City of Espoo), and client utilizes them within the agreed terms. Arandur Oy has undertaken the lifecycle responsibilities of the Kaivomestari facilities as stated below. In case of insufficient performance with services such as cleaning, gardening, school catering, heating etc., the service fee paid by the City of Espoo will be reduced by sanction fees.

Lifecycle responsibilities of Arandur Oy:

1. State of facilities

- The facilities should be in operational function at all times

- The utility value of the facilities should equal to the utility value of new facilities at the end of the contract period

2. Maintenance, operation and energy consumption

- The subcontractors are responsible for the management and operation of the facilities at a fixed service fee for the whole contract period
- Shortages in the maintenance will be paid back as repair costs and sanction fees

3. Services

- The subcontractors are responsible for generating the services needed
- The way of arranging the services is free, the most effective way to be preferred

When the PPP contract ends in 2028, the City of Espoo can redeem the facilities from the financier.

In Lithuania, the City of Vilnius has been forerunner in using PPP models in many fields, including energy supply, social, commercial and recreational facilities. In the energy supply sector, a 15-year concession was granted to Vilnius Energija, a Lithuanian subsidiary of Dalkia in 2001. About 163 MEUR is expected to be invested in the renovation of boilers and networks as well as in conversion of some boilers to biofuels. As a result, the price for heating has been reduced considerably and is the lowest for any urban heating network in Lithuania (0.009954 Litas per kWh). Even though many residential customers prefer direct control over their heating expenses, this was impossible to implement with the previous boilerine substations. After replacing them with individual building substations with modern heat exchangers and an advanced consumption metering system, new consumption metering systems are being introduced gradually, dependent on unanimous agreement of all the co-owners of a building. A special energy saving fund set up by Vilniaus Energija with backing from the GEF/World Bank bears 75% of the expense of this programme (or 100% for low-income households).

On the Vilnius educational sector, a feasibility study was commissioned in 2006 by the City to study the alternatives in financing the necessary investments. After the analysis by the consultants, it was evident that neither the limited funds of the city budget or loans, nor consistently decreasing financing from the State investment programmes, or reluctantly granted EU aid, will provide conditions for solving all the issues concerning renovation of the educational institutions of the capital. Most of these institutions had not been subject to major repairs since their construction, and, therefore, 80 % of schools and 99 % of kindergartens currently need repairs. Thus, the City decided to select private partners through an open tender. Fifteen educational institutions were chosen for the pilot project and the total expected private investment is over 30 MEUR. A PPP scheme on public procurement basis was developed for 30 years period. With the use of funds from private investors and competence, efforts will be made to improve and renovate buildings and territories of the city educational institutions. Private partners selected through tenders will provide maintenance of the buildings, utilities and territories, and other services. As a result of the use of private investors' funds, the borrowing limit of the Municipality will not decrease; buildings and

other assets of the educational institutions will not be privatized and will remain on the balance of the Municipality.

Since year 2002, a Lithuanian private company City Service has provided maintenance for heat and hot water supply and repair services for schools and kindergartens in Vilnius. The company also renovates heating networks as a general contractor for Vilnius Energija and Litesko and provides Energy Performance Certification for buildings. It has also concluded agreements on repair services for engineering systems with schools and kindergartens in other cities of Siauliai, in total over 200 educational buildings in Lithuania. During the visit to Kaunas in April 2008, the representatives of the City told that negotiations regarding a 25-year concession for 192 secondary schools and kindergartens in Kaunas (550 thousand m²) were held with City Service four years ago but did not lead to a mutually beneficial agreement. The Company is currently involved as a claimant in an administrative case against the Council of Kaunas City Municipality to resume the negotiations that has been won by the Company in a public tender.

5.4 Assessment of potential to use ESCO/EPC/PPP models in public building sector of Kaunas

In order to be economically feasible, the ESCO model requires certain minimum conditions to be met. For instance, there is little use for the basic ESCO model in buildings that are in poor condition structurally.

In Kaunas, the audited buildings were chosen to represent buildings in different conditions from poor to good. During audits, it was noticed that there are practically no building systems in use in the schools and kindergartens audited and that many of them were in need of a thorough renovation. The technical level was low and there were problems with poor insulation, single glass windows and also different constructional issues.

When applying the basic ESCO model in which the investment is paid back purely by the accumulated savings, practice has shown that it is of great importance that the building has at least some kind of building systems in use and is not in an immediate need of renovation. This is because installations of building systems, such as air conditioning, will invariably increase the energy consumption, although it will be beneficial for the indoor air quality in many other ways.

It is also recommended that the target buildings to be renovated should be audited before the renovation to identify possible energy efficiency improvements so that the necessary energy investments could be carried out as an ESCO project linked to the renovation (as described above in “ESCO as part of a renovation project”).

In the present situation in Kaunas, the ESCO model is probably not optimal for improving the energy performance of the municipal buildings in general. In some cases, it can still be recommended to consider using the basic ESCO model as the fastest and most cost-efficient way to implement the identified energy saving measures and efficiency improvements. Criteria to determine which projects are suitable for using the basic ESCO model are shown in Table 3. It is also recommended that consider if the renovation ESCO concept could be modified to be used in Lithuania. At the time-being, YIT recommends that the Kaunas

authorities consider the Kaunas Second Clinical Hospital, visited in December 2007, to be used as a pilot project if the Municipality of Kaunas decides to try out the ESCO concept.

In general, the EPC model is certainly more suitable than the basic ESCO model in Kaunas, considering the present situation. Because the buildings are in great need of constructional and technical renovation as well as of improvements in the area of energy performance, the EPC model could be the right solution. However, as is the case for the ESCO model, an EPC project also has to fulfill some minimum criteria in order to be profitable. Simplified, it could be said that buildings in average condition, and in some cases even in good condition, are most feasible targets for EPC projects. Window renovations and insulation work can typically be included in an EPC project.

However, the biggest potential in Kaunas is most certainly in the area of PPP projects. The PPP model is useful when the building is in bad condition and need a really thorough renovation or even need to be rebuilt. In the PPP-model, the biggest benefit is that the new /renovated building is optimized for its use in every possible way.

In Kaunas, many of the sights visited proved to be in such condition that they would gain most of a PPP project. Generally, schools and kindergartens do seldom prove to be attractive for ESCO operators but make good candidates for EPC and PPP projects.

Table 3. Basic criteria for applying the ESCO/EPC/PPP models

	ESCO	EPC	PPP
Project type:			
State of the target building:	good condition (also average condition)	average to good condition	poor condition, need for rebuilding
Energy saving action:	one simple, clear target for project based on i. e. energy audit	many different due to the overall view of the buildings needs	many different due to the overall view of the buildings needs, including new building projects
Investment/ size:	20 000 -2 MEUR	200 000 -10 MEUR	5 -100 MEUR

It should also be noted that all the models above will need to be modified to suit the legislative and business environment in the country where they will be applied.

There is clearly a potential and need for all presented models in Lithuania and it is strongly recommended to consider further projects where to tailor the ESCO, EPC and PPP models to meet the local needs.

In Finland, an ESCO handbook was produced by Motiva Oy in 2000 and has been a guideline for the business in Finland ever since. Especially as the market is not developed yet, this kind of a handbook could be a market opener. Motiva Oy is an impartial company founded and owned by the Ministry of Trade and Industry in Finland. Its aim is to provide information to improve the energy performance and energy and material efficiency.

5.5 ESCOs in Lithuania

Currently, there are no companies using the ESCO model based on shared and/or guaranteed savings principle on the end-user side in Lithuania. The existing companies, although using the ESCO concept in describing their services, are either providing energy supply services or working as consultancy companies.

In 2001, a company called JSC Newheat was set up by Private Energy Market Fund (PEMF) and JSC Šilumos Ūkio Servisas ("District Heating Service Company", "SUS") with the purpose of launching the ESCO concept in Lithuania, focusing on energy efficiency investments for the municipal energy utilities based on leasing financing. Local co-investor SUS, a consulting and engineering company, gives NEWHEAT a strong market support and credibility on local municipal energy market. SUS is owned by 18 biggest district heating utilities in Lithuania, including Klaipeda, Vilnius, Kaunas and Panevėžys. However, according to Lithuanian contacts, the company is mainly using leasing and not energy savings to finance its projects. It mainly focuses on energy sector consulting, strategic planning, project development, implementation and lease financing.

Another ESCO company mentioned in Kaunas is JSC Ekoresursai. The company is preparing and implementing energy projects (bio-CHP, bio-boiler plants and new technologies) and also involved in joint implementation (JI) project development.

6 Other possible financing sources

6.1 EU Structural Funds

Lithuanian strategy for EU structural funds for 2007-2013 allocates funds for energy efficiency improvements under the following two priorities:

1) The program of "Economic growth" Priority 4.1 "Energy supply networks"

- Modernization of district heat supply system – 254 million LTL (6 mill. LTL/project)

2) The program "Cohesion promotion" Priority 3.4 "Increase in energy production and use efficiency and use of renewable energy sources":

- Increase in energy production efficiency- 95 million LTL (6 mill. LTL/project).
- Use of renewable energy sources – 127 million LTL (18 mill. LTL/project)

- Renovation of public buildings- 791 million LTL

The maximum amount of support for one project for municipalities is 4 million Litass and the maximum amount of support for project for governmental institutions is 8 million Litass.

6.2 Lithuanian Environmental Investment Fund (LEIF)

The main goal of LEIF is to support public and private sectors in realization of environmental projects and projects to reduce the negative impact of economic activities on environment in compliance with the Environmental Strategy of the Republic of Lithuania. The Fund supports investment projects in the form of soft loans and subsidies. The Supervisory Board of the Fund establishes on annual basis which type of applicants and which field of environmental investments shall be granted for the aforementioned types of financing. The Fund provides financial support for environmentally beneficial investment projects of legal bodies duly incorporated in the Republic of Lithuania and engaged in economic activities, as well as for appropriate projects of natural persons and municipalities, the implementation of which reduces negative impact on environment by the economic activities.

The main capital source for LEIF is the 30 % pollution tax paid to LEIF since year 2000 on the basis of the Law on Environmental Pollution Tax, which makes about 12 million LTL/year. The extension of LEIF loans for financing investment projects is made through commercial banks and leasing companies that can co-finance the projects as well as assume the risk for non-repayment of a loan.

Table 4. Subsidies for GHG emission reduction projects from LEIF (www.laaif.lt, 2007-11-09)

The amount of the subsidy to one beneficiary may not exceed 600 000 Litass in three years and 70 % of the total amount of investment in environmental protection measures.
Subsidies from the money of the Fund may be granted to beneficiaries only together with a loan provided by a Credit Institution (Commercial Bank, Leasing Company) for financing of the implementation of the beneficiary's project.
Subsidies may be granted to municipalities and enterprises of municipalities regardless of whether a Credit Institution is financing their projects or not.
The Fund may grant subsidies only for partial or total covering of a loan provided by a Credit Institution.
Fund payments to the beneficiaries are made on the basis of an agreement on subsidies through a Credit Institution.
The subsidies are repaid after a beneficiary has fully completed implementation of the project.

Table 5. Soft Loans to GHG emission reduction projects from LEIF (www.laaif.lt, 2007-11-09)

The maximum amount of a loan for financing a single investment project shall make up to 1.5 million litas.

The loan shall be provided only in national currency. Maximum term for the loan allocation is 5 years, if the loan is provided by the Fund.

Fund loans are provided through Credit Institution (Commercial Banks, Leasing Companies) which assume the risk for loan non-repayment and which provide at least 30 percent of the loan amount from their own fund.

Fund does not calculate interest for its part of the loan; the interest is dependent on the margin set by the Credit Institution.

The list of the projects funded by Lithuanian Environmental Investment Fund can be found from the website www.laaif.lt. The projects include waste and waste water management and treatment projects, boiler reconstruction and renovation projects, renewable energy projects and heating system renovations in schools.

As per order of the Minister of Environment of the Republic of Lithuania (2003), LEIF has also been designated to be responsible for the implementation of mechanisms as set out in the Kyoto Protocol to the United Nations Framework Convention on Climate Change, and the requirements of any related EU legislation. LEIF has been also authorized to manage and administer the Lithuanian Greenhouse Gas Registry.

Local authorities in Lithuania can develop their own climate change mitigation strategies based on global, EU and Lithuanian policy priorities and established targets, and, that way, contribute considerably to achieving the Lithuanian Kyoto targets for CO₂ emission reduction. The first step in developing climate change mitigation strategy at local level is the selection of the main themes relevant to climate change mitigation at local level. Based on experience of other countries the following main themes or priority areas for local climate change mitigation strategy development can be addressed: 1. Climate policy, 2. Buildings & housing; 3. Infrastructure (energy supply, transport, waste management etc.); 4. Land-use, forestry & agriculture. As in other countries, the Government needs to pay more attention to the implementation of national strategies on local level and set up incentives for municipalities to develop local GHG mitigation strategies, including energy efficiency investments. Local climate change mitigation strategies based on priorities of National strategy for implementation of UNFCCC should be developed within the framework of Local energy development plans or Strategic development plans. Investments for GHG reduction projects can be obtained from Structural Funds, LEIF grants and soft loans and Joint Implementation (JI) projects.

However, the incentives provided by the Kyoto mechanisms, including the possible use in the EU Emissions Trading System of credits generated through joint implementation (JI) project activities are not sufficient to support energy efficiency projects in Lithuania. This is because for the small-scale energy efficiency projects, the transaction costs for project development are too high, if projects cannot be bundled

together. In terms of capturing emission reductions at the EU level, JI has not yet proven to be a very effective mechanism. New mechanisms are also needed for targeting the emissions outside the ETS, such as the building sector, which accounts for approximately 40 % of the GHG emissions in Lithuania.

6.3 Green Investment Schemes and other possible future investment mechanisms

All the new Eastern European EU member states, including Lithuania, have relatively high energy intensity in comparison with EU-15. Although the energy efficiency and CO2 mitigation potential is very cost-effective especially in buildings, biomass and biofuels sectors, these countries have limited resources for energy efficiency improvements due to budget deficits. As JI projects are not suitable for carrying out energy efficiency measures in the building sector, other mechanisms are needed to realize the potential especially in this sector. Green Investment Schemes (GIS) could be one option for delivering energy efficiency improvements in buildings, and Governments in the CEE countries should jointly consider how to design and develop this mechanism. GIS are ear-marked funds generated from the sales of assigned emission allowances (AAUs) for use in environmentally-related projects.

The Directive 2006/32/EC on end-use energy efficiency and energy services was adopted on 5 May 2006. The directive should have been transferred into national legal system on April 2008. The national energy saving target for Lithuania in 2016 is 332.6 thou toe (3.9 TWh). The savings should be monitored since 1 January 2008. There are 3 main measures to implement directive: Energy services and energy audits; Voluntary agreements and White certificates (can be proposed by EC in 3 years after implementation of Directive).

Voluntary agreements (VA) can be signed with Ministry of Economy. The examples of VA in Lithuania exist. In 2006, 3 larger companies of chemical industry: Achema, Lifosa and Mazeikiu Nafta signed VA with the Ministry of Environment. They agreed to cooperate in preparation of legal documents and support environmental awareness actions in Lithuania. The idea of VA in energy savings were discussed with the major Lithuanian energy suppliers. The VA today can be the optimal way to implement Directive 2006/32/EC in Lithuania.

6.4 Summary of funds used in recent years

The tables below summarize Lithuanian funds and programmes to support sustainable energy projects in recent years. In addition, Annex 1 gives an overview of main strategic and legislative documents for the development of the energy sector in Lithuania.

Table 6. Summary of funds allocated for sustainable energy projects in recent years

Time period	Name	Budget spent (per year or over a period)
2005–2007	The special programme-implementation of energy saving	1,7 mill. EUR/year

	projects	
1996–2006	Lithuanian environmental investment fund	4,5 mill. EUR/year
2005–2008	Fund for implementation of National Energy efficiency programme	0,580 mill. EUR/year
2006	Financing programme for Multi-flat buildings modernization	2 mill. EUR
2004–2006	EU Structural Funds: Operational programme 1: Ensuring of Energy Supply Stability, Accessibility and Increased Efficiency	82,76 mill. EUR/period

In the residential sector, the World Bank was providing a GEF grant and a loan in years 1996-2001 within the Energy Efficiency/Housing Pilot Project. For demonstration purposes, thermal improvements in schools were included as well. The on-going (until June 30, 2008) Vilnius Heat Demand Project is helping increase energy efficiency in residential buildings in Lithuania's capital city. As described above, a fund has been set up to partially finance metering and other measures in the housing sector within the project. However, because of EU accession, Lithuania graduated from World Bank borrower status to that of donor partner on September 17, 2006 so no new loans are forthcoming.

Table 7. Financial aid to sustainable energy projects in recent years in Lithuania

	Industry	Public sector	Households
Investment subsidies	For private companies 75 % from Structural Funds: Measure "Direct support to business"	For public sector 75% from Structural Funds: Measure "Ensuring of Energy Supply Stability, Accessibility and Increased Efficiency"	For individual metering and regulation system in apartments (75 % from Energy efficiency fund of Vilnius Energija)
Soft loans	The loan should not exceed 80% of project value and provided from Lithuanian Environmental Investment Fund	The loan should not exceed 80% of project value and provided from Lithuanian Environmental Investment Fund	15-30 % loan subsidy from "Financing programme for Multi-flat buildings modernization"

6.5 Fiscal measures

In Lithuania, sustainable energy investments are also supported by fiscal measures, such as tax exemptions and feed-in tariffs.

The standard rate of Value Added Taxes (VAT) is 18 percent. The rate of VAT for the heat for residents is only 5 percent. The difference between 18 to 5 percent shall be covered from the state budget of the Republic of Lithuania in the amount of 13 percent pursuant to the procedure established by the Government of the Republic of Lithuania. The rate of VAT for the construction of the housing, insulation and renovation of buildings is 9 percent. The difference shall be paid from the state budget and municipal funds as well as from the soft credits granted by the state and the state special funds. The rate of VAT on export is 0 percent.

The Law on Amendment of the Excise Law adopted in 2004 provides for the power produced from the renewables to be exempted from the excise tax; an excise grace is applied to the part of biofuel corresponding to the part of additives of biologic origin in one ton of the product. The Law on the Environment Tax as well as the Laws on the Supplement and Amendment of the said Law establish that legal and natural persons shall be exempted from the tax applicable for environment pollution by mobile and stationary pollution sources if the said persons use standard biofuels and provide written evidence of the usage of said biofuels.

Feed-in tariffs are applied for electricity produced from CHP. Every year the Energy Price Commission approves feed-in tariffs of electricity generated in cogeneration power plants. The average feed-in tariff of such electricity in 2005-2006 was 1.2-1.4 times higher than the average electricity generation tariff in the country.

Environmentally favorable heat pricing is applied as well. Energy tariffs regulated by the State are determined by the Commission on the basis of assessment of the validity of the return on investment and activity expenditures. Expenditures required for environmental projects are included into calculations of the prices regulated by the State. The principle of the Methodology for Pricing of Centrally Supplied Heat and Hot Water approved in 2003 favors more environmentally friendly energy generation.

The period of the base tariffs set observing this Methodology is from 3 to 5 years. During this period, enterprises can convert from imported fuel (e.g. heavy fuel oil) to cheaper fuel (in this case, biofuel) or install more efficient energy generation equipment. When doing annual calculation during the base tariff period, the fuel expenditures (composition and consumed amount) are not changed. Therefore, conversion to cheaper fuel or energy efficiency improvements at the beginning of the tariff price period yields profit gained due to the fuel costs difference, which facilitates return on investments.

7 Possible areas and partners for further co-operation with Kaunas

In Kaunas, the municipality has been actively supporting EU projects that facilitate the implementation of the EU directives in partnership with relevant institutions: the Lithuanian Energy Institute (LEI), Kaunas

Regional Energy Agency (KREA) and the Institute of Environmental Engineering (KTU Apini) of Kaunas University of Technology. For example, Kaunas city was the first in Lithuania to participate in the European Display® Campaign that was a voluntary scheme designed by energy experts from 20 European towns and cities with the purpose of encouraging local authorities to publicly display the energy and environmental performances of their public buildings. Kaunas municipality is also participating in the European Energy Award (www.eea.org) that allows municipalities to identify strengths, weaknesses and potential for improvement and, above all, implement effectively energy efficient measures. Kaunas Region is also involved in Intelligent Energy Europe-project “Energy 4 Cohesion” (E4C).

During the implementation of this pre-feasibility study, the representatives of Green Net Finland met with all the above-mentioned institutions in order to learn from their experience on the real status and potential of improving the energy efficiency in public buildings in Kaunas. During the visits, discussions were also held on possibilities of cooperation on different themes within a larger joint project.

According to the discussions, there are practically no experiences of ESCO concept in public sector in Lithuania. At the moment, energy auditing is gaining ground, although the majority of the audits are directed to the private sector. KREA has been using the methods developed in the Display® Campaign in audits of 20 school buildings in Kaunas, and possesses valuable information of the potential for energy savings. Lithuanian Energy Institute has a long background in research, and possesses very good network of possible partners for cooperation.

Discussions with these parties gave a good overview of the actual legislative and business environment and current market situation in Kaunas. It was agreed that the exchange of ideas on future cooperation projects will continue after this project ends. For example, regardless of already implemented projects, many market barriers still exist in Lithuania for the development of the functioning ESCO market. These barriers include poor awareness on the feasibility of the ESCO concept as well as lack of knowledge and experience on the practical implementation of ESCO model in the public as well as financial sector. Although this project has somewhat contributed to removing these barriers, there is still need for further co-operation. Especially in the renovation part of the building sector new business and financing models are very much needed and best practices already developed in other countries should be applied and tailored to local needs.

7.1 LEI

Lithuanian Energy Institute is a state-owned scientific organization focusing on carrying out long-term scientific research projects related to power engineering safety, energy economics, metrology and engineering (http://www.lei.lt/_img/_up/File/atvir/eng-leidin/LEI_annual_report_2006.pdf).

LEI is currently participating in a project “Energy 4 Cohesion” (E4C) together with the Kaunas Region. The project was launched in the beginning of 2006 to promote renewable energy and rational use of energy in less developed rural areas of Europe and to prepare the ground for the extended use of Structural Funds in the programming period of 2007-2013. The strategy in E4C is to support the implementation of energy pilot actions in selected target regions. The energy vision by 2020 in Kaunas Region places security of the energy

supply as the first priority, followed by energy efficiency improvements in the existing building stock. Other priorities include efficient production of heat and electricity, diversity of primary energy resources, education and research and cooperation. So far, three innovative projects suitable for Structural and Cohesion funding have been developed in Kaunas Region:

- Lapes city landfill gas utilization in CHP plant
- Biogas utilization in CHP plant of JSC "Kauno Vandenys"
- Renovation of DH network of city Birstonas.

(www.e4c.org)

7.2 KREA

Kaunas Regional Energy Agency (KREA) was founded in 2003 under SAVE II Programme project "Establishment of three SAVE Energy Management Agencies in the Municipality of Venice, Italy, the Region of Kaunas, Lithuania, the Region of Reunion, France". KREA has a legal status of Public Institution. The founders of KREA are Kaunas City Municipality, Lithuanian Energy Institute, Kaunas University of Technology and SC "Kauno energija".

The main objectives of KREA are:

- to promote rational use of energy
- to promote use of renewable energy sources
- contribute to environmental protection
- cooperation with partners from other EU countries and dissemination of information on their experience in energy and environmental protection fields
- information, public awareness, training seminars for students, communities and energy specialists.

KREA has expertise in energy auditing, biomass and bioenergy and thermal energy generation and consumption. The target audience includes industrial companies, consumers and households, local authorities, energy specialists and students. More information about the activities can be found on the website (www.krea.lt).

Currently KREA is involved in planning of a new energy efficiency project targeted to the municipalities, together with representatives of EEA in Switzerland. KREA is also actively involved in the activities of Energie-Cités. Despite the name "Kaunas Regional Energy Agency", KREA is active nation-wide in Lithuania, for example in Vilnius KREA has carried out DISPLAY-audits in schools and kindergartens.

KREA is interested in cooperation related to utilization of the data gathered through audits in improvement of energy efficiency in public sector. KREA also presented a project proposal regarding a demonstration

project in low-energy building, good practices and exchange of knowledge. The consortium for the demonstration project could include Baltic countries and other new EU-member countries such as Poland, and Finland.

7.3 KTU Apini

Apini was established in 1991 as an independent research unit under Kaunas University of Technology. Since 2000, Apini also has an office in Vilnius. Apini is active in following areas of expertise in research and consulting:

- Environmental and quality management systems
- Cleaner production
- Integrated waste management
- Eco-design and LCA
- Environmental Impact Assessment
- Chemical risk assessment and management
- Basin management
- International cooperation

KTU Apini has also been active in environmental auditing especially in private sector, and is interested in developing the energy performance auditing concept. Projects related to clean production and alternative fuels could also be interesting for KTU Apini.

8 Conclusions and recommendations

There is a wide variety of ESCO and EPC concepts used in different countries and by different service providers. Regarding the present situation in Lithuania, although basic legislative framework exists to support ESCO and EPC projects and model contracts have been developed within EU projects, the market has not yet developed due to other barriers. One of the most important barriers is the lack of information and limited understanding of the importance and benefits of energy efficiency by authorities (potential clients). Furthermore, administrative hurdles persist, such as complicated procurement procedures. In order to encourage private companies to become active ESCO or EPC service providers, pilot implementation of a Lithuanian ESCO/EPC service model and a possible contract model could be the first step on the way. Evaluating these models, there would be a base for companies interested in starting up ESCO services. At the same time, the service providers themselves, financial providers as well as the clients (municipal authorities) need further skills training in developing bankable energy efficiency projects. A

suitable way to start the evaluation process of the ESCO/EPC service model and contract could be as part of a larger energy- or climate-related project. Best practices from already implemented projects within the region and wider EU should be applied and tailored to local conditions. For example, it could be beneficial to use the Finnish experiences from the JUMESCO project that was a part of the Climtech technology and climate change programme (1999-2002). The aim of the JUMESCO project was to embed the ESCO services to the municipal sector. At EU level, similar type of project PU-Benefits, focusing on how to use energy services in public buildings at local level, was implemented in 2005-2007 within the Intelligent Energy Europe Programme. These are just few examples of work that has already been done and could be utilized in promoting the use of ESCO/EPC concepts in Kaunas.

It can be stated that there exists concrete possibilities for improving energy efficiency in schools and kindergartens in Kaunas by further development of ESCO/EPC and PPP concepts suitable for the local needs as well as through better utilization of the available funding from EU structural funds and soft loans and funds of LEIF. As the construction of the new buildings slows down, the interest of private companies to further penetrate the renovation sector and develop new business models is also likely to increase. Life-cycle cost analysis should be implemented always when considering the renovation of the buildings – proper analysis often justifies higher initial investment costs if the maintenance costs can be reduced in return, resulting in overall savings during the life cycle of the building. The improvement of overall indoor air quality should be one of the main goals when designing renovation projects, especially in the educational sector. Even if not financially justified on their own, the ESCO and EPC contract models can be used as a tool to implement the energy saving measures and efficiency improvements to add value to traditional renovation projects.

References

European Bank for Reconstruction and Development (2006). *Strategy for Lithuania*.

Mickaityte, Aiste (2008). *The Concept Model of Sustainable Buildings Refurbishment*. Published in International Journal of Strategic Property Management, March 2008. [article]

Novikova, Aleksandra; Central European University (2006). *Improving Energy Efficiency on a New Europe: Leveraging the Kyoto Flexibility Mechanisms – past, present & future. Executive Summary Report*. 28th September 2006, Somerville College, University of Oxford. Edited by: Sarah Keay-Bright and Jane Palmer, UKERC Meeting Place. Published by UK Energy Research Centre.

Štreimikienė Dalia, Lithuanian Energy Institute. Financial support for CO₂ reduction projects. A presentation at BALANCE project expert meeting, Kaunas, 10 May 2007.

Štreimikienė Dalia, Bubelienė Jolanta and Glemžienė Regina, Lithuanian Energy Institute. Review of Instruments for Promotion of Energy Efficiency in Lithuania. Environmental Research, Engineering and Management, 2007.No.1 (39), P. 38-48

Annex 1. Overview of legal and institutional measures to support EE investments in Lithuania

The main factors that influence a stable functioning of the energy sector in Lithuania are:

- 1) prevalence of import of primary energy resources from Russia, dependence of Lithuania's gas supply and electricity systems on Russia's energy systems as well as absence of interconnections with Western European energy systems;
- 2) the decommissioning of the Ignalina NPP in 2009, which has a considerable detrimental effect on the structure of electricity sources, primary energy balance and electricity price in 2010-2015;
- 3) the strict environmental requirements set forth to energy enterprises, including restrictions on carbon dioxide emissions.

Improving efficiency of energy generation and consumption and increasing usage of renewable energy sources could soften the negative influence of above-mentioned factors.

The key legal and institutional measures to promote energy efficiency and greenhouse gas reduction investments in Lithuania are found in the documents listed in table 1.

Table 1. Strategic legislative documents in the field of energy and environment in Lithuania

Document	Description
<p>National sustainable development strategy, 2001 (National environmental strategy, 1996)</p>	<ul style="list-style-type: none"> • To reduce energy intensity of GDP by 50% up to 2020; • To reach the share of renewables – 12% in TPES by 2010; • To reach the share of renewables – 10% in totalelectricity production by 2010; • To reach the share of CHP –35% of total electricity production by 2020; • To reduce CO2 emissions per GDP, per energy unit; • To reduce SO2, NOx emissions per GDP, energy unit. <p>The responsible institution is Ministry of Environment</p>
<p>National energy efficiency programme, 2006</p>	<ul style="list-style-type: none"> • Aim: Upgrading the efficiency of energy production and consumption and extension of use of renewable energy sources. • Targets:

	<ul style="list-style-type: none"> • CHP would make 20% up to 2010 and 35% up to 2020 of all electricity produced • RES would make 12 % in total primary energy supply up to 2010 • RES would make 7% of total electricity consumption up to 2010 • heat consumption in buildings would be reduced by 7% up to 2010 • waste energy resource utilisation would make 2 TWh up to 2010; • biofuels would make 5.75% of all fuel used in transport sector by 2010; • GHG emissions would not exceed Kyoto target (8% reduced GHG emission level of 1990); • CO2 emissions would decline by 32% from 2004 level in 2010; • SO2 emissions would decline by 3% from 2004 level in 2010; • NOx emissions would decline by 21% from 2004 level in 2010; <p>The responsible institution is Ministry of Economy and implementing body is Energy Agency</p>
<p>National energy strategy, 2007</p>	<ul style="list-style-type: none"> • Aim: well balanced, modern energy sector able to ensure security of supply and having small impact on environment, creating conditions for economic growth. The chapters in strategy are based on priorities of energy sector development. <p>The targets:</p> <ul style="list-style-type: none"> • To reach the share of renewables – 12% in TPES by 2010 and 20% by 2025; • To reach the share of renewables – 7% in total electricity production by 2010 and 10% by 2025; • To reach the share of CHP –20% up to 2010 and 35% up to 2020 of total electricity produced in that year; • The Law sets a target to increase the share of bio fuel consumed in the transport sector to 5.75% in 2010, 15% by 2020 and 20% in 2025 <p>The responsible institution is Ministry of Economy and Implementing body is</p>

	Energy Agency
<p>National strategy for implementation of UNFCCC, 2006</p>	<ul style="list-style-type: none"> • Aim: To implement Kyoto target • Targets: <ul style="list-style-type: none"> • To ensure natural gas share of 35% in 2012 • To ensure 13% of RES in total primary energy supply up to 2012 (not less than 12 TWh produced from RES) and 15% by 2020; • To reduce energy intensity of GDP by 40-50%; • To ensure the share of new technologies by 20-25% in industrial production; • To increase the share of CHP and achieve 35% in electricity production by 2020 • To ensure 13% of biofuels used in transport sector by 2012 <p>The responsible institution is Ministry of Environment, LEIF</p>
<p>Single Programming Document, 2004</p>	<p>Single Programming Document 2004-2007, Measure 1.2: Ensuring of Energy Supply Stability, Accessibility and Increased Efficiency</p> <p>The funds allocated: 82.76 MEUR.</p> <p>Supported activities:</p> <p>1 – Development of energy supply networks: building of new electricity transmission lines, development of regional district heat supply networks, development of local natural gas distribution networks, regional cooperation and development projects;</p> <p>2 - Renovation of boilers and adjustment to use other fuels (biomass or natural gas)</p> <p>3 - Local and renewable energy sources development projects</p> <p>4 - Increase of energy efficiency in public sector: insulation of buildings, reconstruction of energy supply equipment in buildings, energy audits, etc.</p>
<p>Lithuanian strategy of EU structural aid use in</p>	<p>SF in 2007-2013</p> <ul style="list-style-type: none"> • The programme of “Economic growth” • Priority 4.1 “Energy supply networks”

<p>2007-2013</p>	<p>1. Modernization of district heat supply system – 254 mill. Lt (6mill/project)</p> <ul style="list-style-type: none"> • Programme “Cohesion promotion” • Priority 3.4 “Increase in energy production and use efficiency and use of renewable energy sources”: <p>1. Increase in energy production efficiency- 95 mill. Lt (6 mill. Lt/project).</p> <p>2. Use of renewable energy sources – 127 mill. Lt (18 mill. Lt/project)</p> <p>3. Renovation of public buildings- 791 mill Lt</p> <p>The maximal amount of support for one project for municipalities – 4 mill. Lt</p> <p>The maximal amount of support for project for governmental institutions – 8 mill. Lt</p>
-------------------------	--

N.B. Annexes 2-7 Energy Inspection Reports of Target Buildings are not made publicly available due to their length and technical nature at the decision of the steering committee.