Financing energy efficiency and renewable energy projects

BEST PRACTICE MANUAL

ENGLISH SUMMARY

Intelligent Energy Europe

Best Practice Manual

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The project CF-SEP, Commercial Finance for Sustainable Energy Projects, has obtained financial support from the European Commission under the contract no. EIE/05/205/SI2.419687 Intelligent Energy – Europe (IEE) - SAVE, ALTENER, STEER and Horizontal Key Actions -Type 1 Actions

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Introduction

The implementation of energy efficiency projects (EE) and projects utilising renewable energy sources (RES) through out the European Community, and in particular in new Member States faces two key obstacles:

1. inadequate access to commercial lending for smaller projects, given the lack of understanding among financial institutions (FIs) of the opportunities and risks of EE and RES markets; and
2. inadequate capacity of sponsors of EE and RES projects in preparing and marketing "bankable" projects to the FIs

The combination of these two, but inter-related market issues, significantly impairs the development of the EE and RES markets.

The CF-SEP project (Commercial financing for sustainable energy projects), implemented simultaneously in five countries (Czech Republic, Slovakia, Lithuania, Latvia and Estonia) aimed to overcome the above mentioned disconnection between project sponsors and FIs resulting in substantial expansion of availability of commercial lending for the relevant projects.

This best practice energy efficiency (EE) and renewable energy sources (RES) finance manual aims at summarizing the experiences and lessons learnt during the implementation of the CF-SEP project, in particular focusing on country level experiences in:

1. Developing and bringing to commercial financing EE and RES projects.
2. Cooperating with commercial banks

The manual provides an overview of the basic rules and examples for preparation of the EE and RES project proposals (mainly Feasibility Study and Business Plan templates), included are also examples of the bank requirements, project examples (case studies) and assessment of typical risks.

This manual is mainly addressed to the project developers who already have plausible energy efficiency and renewable energy projects in the pipeline and are looking for minimizing their risks and on lessons learnt from other projects.

Given that there is not a simple formula to indicate what is a plausible project, in this manual it has been considered a project, which includes the use of proven technologies and practices, and achieves substantial energy savings/revenues to provide positive economical indicators.

Consulting companies in the field of energy efficiency and renewable energy sources may also find in this manual useful information for their business.

However, this manual is not meant to be a teaching book on energy efficiency and renewable energy technologies; it is more focused on the lesson learnt from EE and RES projects that have been commercially financed, thank to proper planning and project cycle, in particular in relation to:

- Project identification and scanning
- Preliminary evaluation of the potential
- Feasibility study
- Business planning
- Financing

1. Energy efficiency and renewable energy projects

In this chapter is given a general overview and description about energy efficiency and renewable energy projects. This chapter simply aims to provide the reader with indications on what type of projects this manual is addressing.

1.1 Energy efficiency projects

EE projects are mostly focused on decreasing energy consumption on demand and/or supply side by implementing organisational or investment measures focused on modernisation and/or extension (by comparable energy consumption) of equipment/building, or by its refurbishment or reduction of capacity. In other words, a project is energy efficient when either energy inputs are reduced for a given level of service, or there are increased services for a given amount of energy inputs.

EE projects can be divided into two main categories according to their field of application:

1. EE projects in buildings i.e. energy efficiency measures influencing thermal-technical quality of the building envelope, energy consumption of building equipment and other technical devices as well as the building management, in particular:

a) **Measures focused on improvement of thermal parameters of building envelope** (for example additional thermal insulation and better sealing or replacement of windows,).

b) **Optimisation and/or replacement of electric systems** i.e. lighting (use of EE lighting technologies, regulation of electric peaks, replenishment of lighting reflectors, redesign of placement and number of light points, implementation of day light control); office equipments (for example EE computers can switch automatically into sleep mode or into turn-off in case when they are not in use); electric motors (for example reduction of their operation time by switching-off not needed equipment), optimisation of electric motor operation and use of motors with variable speed)

c) **Optimisation of heating, ventilation and air-conditioning systems**, like or example adjustment of supply/return temperatures on thermostats, installation of additional monitoring systems with constant volume of air, installation of systems with heat recovery; increase of boiler energy efficiency by adjusting the ratio of fuel and air; replacement of old boilers with new energy efficient boilers.

d) **Measures at building energy management system** (BMS) designed to control and lower energy consumption of buildings by means detailed energy monitoring of energy consumption of all loads and implementation of integrated management of their operation. For example a BMS can automatically monitors and regulates indoor temperature, adjusts ventilation rate, controls and dim the lighting system, etc…

e) **Implementation and integration of new technologies**: installation of spectral selective glass areas on building envelope; installation of light pipe technologies for indoor lighting; heat recuperators with wheels and thermal tubes; thermal energy storage systems; heat pumps; absorption cooling systems; installation of condensing boilers; combined heat and power production.

2. EE projects in industry (including district heating and power sector) are projects focused on technology and manufacture process and can be divided into categories according to the type of energy consumed within the industrial process:

a) **Projects reducing fossil fuel use**: heat recovery from exhaust gas (internal and external), use of RES as alternative to the fossil fuel.

b) **Heat generation/consumption projects**: distribution and heat use i.e. increase of EE of heat sources (steam and hot water boilers), replacement of old burners with new and modern ones with bigger specific output, installation of measurement and control system on heating system, increase of EE for heat distribution (thermal insulation of pipelines, rehabilitation and optimisation of distribution system operation), measures to increase EE on demand side (heat exchanger, cooling devices, vaporizers, thickening devices, drying, ventilation and air-conditioning units i.e.: thermal insulation of devices, heat recovery), optimisation of technology process, replacement of old devices with new and more EE devices.

c) **Projects reducing electricity consumption:** using drives with variable speed or operation hours modification for pumps, ventilators and compressors, regulation of power input according to need and installation of more efficient drives, using of adjustable-speed drivers; compensation of power factor by automatic current compensator, for lighting – installation of new more efficient fluorescent lamps, regulation of lighting, etc.

d) **Projects reducing compressed air consumption:** for source of compressed air, replacement of old compressors with new more EE, implementation of automatic systems, placement of lifting neck of the compressor on colder place, adjustment of output pressure level, using filters with lower pressure losses, removal of losses in distribution system and its optimisation, reduction of compressed air consumption and needs in technology processes, installation of heat recovery system using heat from compression.

e) **Projects for energy management of industrial company**: implementation of automation and energy management system, integration and intensification of processes.

1.2 Renewable energy projects

The development of renewable energy project concerns the introduction of energy from biomass, solar, geothermal, wind and water. According to type of the used energy source the RES projects can be divided as follows:

1.2.1 Biomass projects

Wood biomass, agricultural biomass, and biodegradable wastes can be used for different purposes and its use is connected to different types of technologies. The most common commercial projects are related to:

- **Direct firing of biomass**, which can be further categorized depending on type of biomass:
  - o woodchips (most typical)
  - o energy crops (sorrel, fast growing woods etc)
  - o secondary agriculture products (straw from corn, rape etc)
  - o secondary fuels (processed bio-waste, waste water treatment sludge)

  depending on energy produced

  - o heat-only

- power only or
- combined heat and power

and finally depending on fossil fuel use:

- pure biomass (equipment dedicated to biomass)
- co-firing of biomass with fossil fuels (typical use at existing power plant boilers)

- **Processing of biomass** to biofuels
    - solid bio fuels with higher quality (pellets, briquettes)
    - liquid bio fuels – production of bio-ethanol from corn of oil seeds (such as rape)
    - biogas production through anaerobic digestion from crops (maize, hay etc.), agricultural waste and waste from animal breeding and its subsequent use for combined heat and power production
    - gasification of biomass (e.g. production of wood gas) and its subsequent use

1.2.2 Solar energy projects

In general there are two main solar technologies:

- Solar-thermal technology; depending on the technology solar radiation is transformed to:
    - heat at low temperature, which for example can be used for hot water preparation, space heating and drying processes
    - heat at higher temperature enabling also electricity production
- Photovoltaic technology using semiconductor technology for direct conversion of solar radiation to electricity

1.2.3 Geothermal energy projects

The core of the Earth represents a large source of heat, but its possible use depends on geological conditions at the site.

At normal conditions heat of soil or underground water can be used for decentralized heating by means of heat pumps.

However actual geothermal energy projects require special geological conditions creating an underground reservoir of hot water with sufficiently large capacity enabling a sustainable exploitation. It requires a deep boring (several hundred meters or more) bringing the water to the surface. Depending on the temperature level,

- the water at moderate temperatures can be used as the source of heat directly or after additional temperature increase by heat pumps.
- at high temperatures even power generation is possible (natural creation of steam or using the flash affect). Such conditions are very rare and concentrated in particular geothermal area (for example Island and Toscany region in Italy).

A complete map of Europe geothermal resources is available from the Atlas of Geothermal Resources in Europe [2002].

1.2.4 Wind power projects

Wind contains energy, which can be transformed to electricity by using wind turbines. The amount of electricity, which can be produced, is given by the amount of energy contained in the wind going through the blade of the wind turbine in time unit. Flow of wind energy is also called density of wind energy.

Wind intensity is affected by the topography, distance from large water surfaces and elevation. For a good estimation of wind source on a selected place is typically needed one year monitoring data of wind velocity and direction.

1.2.5 Hydropower projects

Hydropower plants use natural or artificial gradient of rivers. According to the size - installed capacity hydropower plants can be divided into the following categories:

- Large hydropower plants with installed capacity more than 10 MW
- Small hydropower plants with installed capacity up to 10 MW. Smaller plants are sometimes called:
    - Mini hydropower plants with installed capacity 100 kW – 1 MW,
    - Micro hydropower plants with installed capacity 5 – 100 kW and
    - Pico hydropower plants with installed capacity up to 5 kW

The output of a hydropower plan is given by the water gradient and by its flow rate. The gradient determines available potential energy of the given area. Then hydropower plants can be classified as:

- Flow-through power plants
- Power plants with water accumulation (typically covering peak demand and fluctuations in electricity consumption)

2. Suggestions and examples for preparation of the EE and RES project proposals

Every project idea, independently from its complexity, needs a certain development process - in particular if external financing of the project is required. The conclusion of this process enables to understand whether a project is plausible, profitable and bankable.

In general a project development process consists of the following minimum activities:

- Project identification and scanning – preliminary evaluation of the potential
- Feasibility study
- Business planning
- Implementation
- Operation

The results from each of these steps needs an evaluation and decisions on whether it is beneficial to continue and invest in the process.

2.1 Project identification and scanning

The starting point of every project is “the good idea” at the beginning. Then, every project is exclusive and should de be treated separately to find individual and adapted solutions.

The project idea is followed by a scanning process, which consists in identifying and in assessing of the total investment, brief calculation of the savings/revenues and a simple profitability analysis. This activity allows understanding whether it is worth to continue in the process and whether the project could be implemented.

If scanning reveals a profitable and beneficial project, then the next step encompasses a more detailed technical and economic analysis, called Feasibility Study – which in case of refurbishment of existing installations/buildings, and could include also an energy audit.

2.2 Hints on how to prepare a good feasibility study

A project idea can be implemented in several different ways and sizes. A *feasibility study* serves for selecting a specific alternative. It compares several variants from different points of view and, on the basis of this evaluation, identifies the most profitable that fills the project needs in the best way. A feasibility study typically contains analyses of individual parts of proposed projects. In particular, it comprises a market analysis; a technical analysis; an economic and financial analysis, including a sensitivity analysis; an evaluation of other factors; and a risk assessment. The feasibility study is the basis and main tool for making the decision on project implementation.

A typical structure of the feasibility study is the following:

1. EXECUTIVE SUMMARY

➢ The executive summary should provide the reader with information for quick orientation in the proposed project including the basic information from each chapter of the feasibility study, particularly focusing on the proposed and selected alternatives.

2. INTRODUCTION

- Explain the project ideas and basis in the simplest way (consider that not all of the readers are familiar with EE and RES and may be, that just these people will be crucial for the project successful implementation).

3. POTENTIAL MARKET ANALYSIS

- Carefully consider particularities of the project production.
- If the intended project product sale is closely associated with certain location (in case of EE and RES usually heat) – detailed analysis of demand volume stability (and possibilities of its retaining) and competitive product supply should be done.
- In case of targeting a wider market (e.g. electricity), the capacity of the market and its saturation should be considered.
- The prediction of price development is always needed.
- It is always necessary to design more variants of production sale.

4. RAW MATERIAL SUPPLY ANALYSIS

- If an existing source of raw material is a part of the project basic idea, the analysis should first and foremost concentrate on detailed consideration of its quality and volume stability.
- The next part of this analysis must be focused on finding and evaluation of alternative raw material sources (including estimation of additional costs).
- Similarly to potential market analysis, also in this step it is necessary to predict the price development of the raw materials.

5. TECHNOLOGY

- Following the potential market volume, it is necessary to set up the appropriate size of project, i.e. the production capacity.
- In connection with this figure, select several technology models from various manufacturers.
- In addition this selection should also reflect the volume and quality of potential raw material sources.
- Carefully consider pros and cons of all of the selected technology models regarding to all mentioned operational points of view.
- As a result of such consideration determine order of possible technology variants in term of their suitability. In other words eliminate the most unsuitable variants.
- For all of the remaining variants estimate the investments costs. Don't forget to include costs arising from miscellaneous inevitable requirements (e.g. building up connection to future customers, calibrating of measuring instruments, training of employees etc.).

6. LEGAL ASPECTS

- The first thing, which must be verified in this area, is potential existence of any restrictions to such types of projects as intended. These may result from general/national level (inhibition of certain technologies, licensing of certain activities, etc.) and from local level (difference with ground plan, interference with protected territory and so on).

- If the intended project is from the previous point of view realizable, other legal maters should be further considered and prepared. These are for instance settlement of rights to real estate properties, contracts with suppliers and customers etc.

7. ECONOMIC SUSTAINABILITY

- In the first place - collect all economic data from previous analyses.
- Economic sustainability of the intended project must be calculated in more variants. It is necessary to consider all combinations of various predicted development options of the project operation (i.e. on the side of potential market and also on the side of raw material supply) and financial resources for all acceptable technology solutions.
- A calculation of all these variants is quite difficult and time-consuming. That's it is advisable to divide these variants into groups based on the technology used. For each technology model there will be a group of variants incorporating various developments and various sources of financing.
- For a successful implementation, at least one of the technology models should prove its economic sustainability in all variants of different development options.
- Typical economic criteria used for project evaluation are the following:
    - **simple payback**: ratio of investment costs to annual net profit It is an auxiliary tool for a rough assessment; suitable for projects with constant cash flow and short payback time.
    - **discounted payback**: time after which the discounted cumulative cash flow becomes positive. It is also suitable only for projects with relatively constant cash flow
    - **net present value** of the project: cumulative discounted cash flow over the project life time. This is the indicator suitable for all project types; it represents the realistic value of the project. However, a positive net present value is not sufficient condition for the feasibility of the project.
    - **internal rate of return:** discount rate for which the net present value of the project is equal to zero. It is a typical tool used for comparing different investment opportunities of investors own financial resources.

8. RISK ANALYSIS

- In this part of the feasibility study, it is necessary to clearly define and name all the risks and also to determine appropriate actions to mitigate them.
- Technical risks connected with different technologies are further described in a separate chapter of this manual.

9. CONCLUSION

- Conclusion should summarize the obtained results of the feasibility study and relevant arguments for selected technical and financial solution of the project implementation. It should be written in a very simple way. It is not necessary to use a lot of technical or economic data. Do not describe all calculated variants, define only the best variant selected for implementation and its basic parameters and efforts

2.3 How to prepare a good business plan

The development of a business plan is the next step of the project preparation phase. It should be closely connected to the feasibility study prepared in the previous step. In contrast to the feasibility study, the business plan will only addresses one project variant derived from the feasibility study. A good business plan will make a very practical projection of procedure and provide a clear and comprehensive description of the project. Business plan must prove that you have a clear idea **about WHAT is to be done and HOW** to successfully implement the project.

Business Plan Structure

A good business plan should start with clear explanation of the **project mission**. This description of basic ideas should be followed by **project SWOT analysis**. In the next step it is necessary to **describe the used technology** and related requirements. In the following step you must prove, that there are suitable **human resources** as basic condition of success.

Following the previous general description of project ideas and requirements, it is necessary to pay attention to economic fundamentals of project. The first step in this area is to **evaluate the target market** and present competition. To prove that you are familiar with project implementation phase, **design the entrepreneurial model**. And as summary of project sustainability, it is necessary to work out the **financial plan** of the project for its whole lifetime.

1. EXECUTIVE SUMMARY

- ✓ This is a very important part of the business plan. An interesting and persuasive Executive Summary will capture the attention of the financial institution.
- ✓ The executive summary must include the most important information and elements from each of the chapters of the Business plan. This includes the basic information on the project idea, on who is making the application for funding, the type and amount of financing needed, indication of the main profitability indicators. In case other institutions financially sponsor the project, this should be stated.
- ✓ The executive summary should not exceed two pages

2. BORROWER

- ✓ Start with the legal entity that will realize the project. Will it be an existing company implementing the project, or a new company will be established?
- ✓ In next step identify the investors.

3. PROJECT INFORMATION

- ✓ To the financial institution the following basic information of the EE and RES projects should be given:
  - o Description of present situation/problem
  - o Objective of the new technology/solutions
  - o Technical description and viability of the project (including evaluated alternatives)
  - o Operation and maintenance including staff training
  - o Benefit from the project, including non-quantifiable benefits and environmental benefits

- o Profitability analysis and indicators, including energy savings/revenues
- o Total costs of implementation (planning, engineering, installation, equipment, management, taxes and duties, transport, legal costs, etc…)
- o Time framework of the investment and project implementation

✓ Use of well-know and proved technologies and components is typically required for commercial financing. It is unusual to obtain financing from commercial financial institutions for research or demonstration projects.

✓ A technical description of the project and its components must be presented in the business plan. However this should be done in a clear and simple comprehensible way, keeping in mind that the description must be understood by the financial institution and is not addressed to sector experts.

✓ It is appropriate to explain advantages, disadvantages (or risks) and requirements of used technology. Competent description of this area will prove your awareness of eventual future problems.

4. SWOT ANALYSIS

✓ The swot analysis should analyse in detail **S**trengths, **W**eaknesses, **O**pportunities and **T**hreats of the project. This analysis should cover construction, operation and also maintenance phase of the proposed project.

5. HUMAN RESOURCES

✓ You should show that the project is in all stages secured by adequately educated and experienced people.

6. MARKET EVALUATION

✓ The ways of describing the market in the business plan depends on the type of project in question. In particular:

- o Energy efficiency improvement and/or renewable energy in an existing facility with an ongoing business
- o Establishment of renewable energy source capacity

✓ For the second type of projects, the financial institutions typically require a well-developed market study, including:

- o Tariff settings/what price are the customers willing to pay?
- o Size of the market, what could be the market share of the project
- o Competitor analysis in the market
- o What are the advantages compared to your competitor

✓ In this part it is necessary to prove the target market volume and its trend. Use relevant time series if possible.

✓ Consider the product price volume and forecast its future development. The forecast should be logically explained.

✓ Identify possible competitors and their advantages and disadvantages against your project.

✓ Evaluate potential impact on project revenues.

7. ENTREPRENEURIAL MODEL OF PROJECT IMPLEMENTATION

- ✓ This is the most important part of business plan. Propose all activities that have to be taken.
- ✓ Start with the definition of legal entity that will realize the project. The project can be realized by existing company, or a newly established company for the purpose of the project.
- ✓ In next step identify the investors. Define their share on total investment costs and on future profits.
- ✓ Propose scheme of financing, i.e. proportions and type of equity and loans.
- ✓ Suggest organizational structure of project management in the phase of construction and also in phase of operation.
- ✓ Estimate project timeline. At least basic milestones must be defined exactly (e.g. as months from the beginning of realization).
- ✓ Define the exit strategy (if appropriate), i.e. consider potential investors in running project.

8. FINANCIAL PLAN

- ✓ The financial plan describes the structure of financing, presenting existing and required sources of financing. This part of the business plan should be prepared very carefully and in details, being the part in which the financial institution is skilled.
- ✓ Do not adopt an optimistic approach. A conservative approach is more appropriate (i.e. consider higher costs and lower revenues/savings).
- ✓ The overall project evaluation should be based on evaluation of the project cash-flow. Consider all expenditures and earnings, both in construction and operational phases. Calculate nominal cash-flow for each year of project lifetime. Quantify present (discounted) value of cumulative cash-flow in each year.
- ✓ The following main information should be included:
    - o Financial sources (selected scheme of financing):
        - ▪ Equity
        - ▪ Grant
        - ▪ External financial sources (local, regional, foreign)
    - o Disbursement plan
    - o Role of the financial institution

9. FINACIAL PROJECTIONS

- ✓ Because the constant ability to pay liabilities in time is the most important assumption for successful project implementation, the overall project evaluation should be based on a project cash flow analysis. For more details of cash flow analysis and evaluation is possible to refer at:
    - o The BEEP project: “bankable energy efficiency projects” at http://www.save-beep.org
    - o Guide to cost-benefit analysis of investment projects at http://ec.europa.eu/regional_policy/sources/docgener/guides/cost/guide02_en.pdf
- ✓ Do not forget to take in account the selected scheme of financing.

- ✓ Example of a good template of business plan is given for national languages in Attachment.

3. Risks of EE and RES projects

3.1 Typical risks associated with project development

RES and EE projects generally need long-term investment and large capital assets. For planning the implementation of such projects and to prepare bankable investment, it is necessary to determine and minimise project risks. Preparations of EE and RES projects need long and in-depth analysis.

Generally the risks coupled with RES and EE projects can be classified into three risk categories, which influence economy of the planned investment directly or indirectly:

3.1.1 Technical risks

a) Construction risk

Construction risk is coupled with technical capacity of the investor to carry out the project and the field work, its managerial capacity and selected subcontractors.

To mitigate and address this risk, the project developer should have a good organisational plan with clear responsibilities, competencies and exactly stated timing of implementation. Selected subcontractors should have experiences in the specific field.

b) Availability of the raw material and its quality, selection of suitable type and size of the technology,

To minimize this risk it is necessary to involve experts in the project preparation. During the development phase it is needed to estimate the availability of the energy source (input), its amount and quality; real possibilities to achieve energy savings or potential of RES utilisation through energy auditing. Important is to consider variants of solutions for implementation of EE/RES technology and its profitability through feasibility analysis, main output of which is definition of the technical parameters of the suitable technology/measures. The energy output of the selected technology and/or planned measures must respect real needs to be economically sustainable.

c) Technology risks

Technology risks can rise by using new, innovative technology, when is not possible to control the operation and efficiency of technology going out of comparable technology application.

d) Operation risks

Institutional, organizational and managerial risks are coupled with proposed structure of management, experiences of the operator, distribution of responsibilities and motivation of the staff, which is responsible for the daily operation and maintenance. These risks can be minimised by closing long-term contracts with specialised companies, which provide for services, repair and/or operation of devices.

e) Risks connected with achievement of guaranteed parameters

of the applied technology, such as output, efficiency, lifetime, maintenance and operational costs, replacement of short-life parts and repairs.

These risks are caused by poor quality design, production and maintenance. Selection of well-known technology, construction and maintenance by experienced company can reduce strongly this risk. The way to treat these risks is well prepared delivery, construction and maintenance contracts with long-term guarantees for technology, equipment and services.

f) Changes of initial parameters

such as energy flows, operation of the technology by partial loading, modification of operation hours can cause problems in achieving guaranteed savings/energy output.

Each developer should therefore prepare within the feasibility study and following business plan analysis of the availability, specification and price of the energy input, market demand for the developer’s services/product and its competitiveness.

3.1.2 Commercial risks

Commercial risks are coupled with each type of investment projects. All financial risks should be analysed in the feasibility analysis and business plan. Under commercial risk is to be understood:

a) Price risks

Price risk is coupled with development of prices involved in operation which can strongly influence profitability of investment project. These include:

raw material purchase prices and

products sale prices (feed-in tariffs/green certificates, under the regulation, heat, electricity, sold to customers)

Expected price development should be analysed as well as possible suppliers and purchasers. Long term contracts on delivery/supply have strong influence on guarantee of the positive cash-flow.

b) Risk of correct estimation of appropriate investment and operational costs

Estimation of investment cost depends on right selection of the economically profitable size of the EE/RES technology. Investment and operation costs should include besides costs for technology also costs for renting, staff costs, maintenance costs for common and general repairs and maintenance of the system, subsidiary capital needed for covering costs to compensate for example environmental impacts etc.

c) Estimation of price and amount of product

This risk results from estimation of accurate costs coupled with project implementation. If possible, close long-term delivery contracts with your customers with fixed prices.

d) Long payback period and interest rate changes

EE and RES project have mostly longer payback period, than the standard commercially acceptable payback period of up to 5-6 years. Considering value of money in time – inflation and expected development of the interest rate and discounting, can considerably influence the result of the economic analysis and the real payback period of the proposed investment.

e) Risk of exchange rate

Loans can be offered also in foreign currency. In this case the debtor takes the risk of exchange rates changes. Usually minimising of this risk is possible by doing all financial transactions without delays.

f) Loan risk and credibility of the investor

Covering of these risks can be provided by adequate guarantees. Usually guarantees for loans exceed more than 100 % of loan drawdown. Disability of debtor to pay credit can rise also as a result of bad functioning of company, what should be possible to identify during the whole loan repayment time. This is also one of the reasons, why banks for appraisal of this risk need the business plan of the debtor.

g) Market risks i.e. competition risk, market needs, risk of profitability

For financial institutions it is important to have clear overview on company's activities and its competitiveness on the market. The existence of market for the project's production is a basic condition. Business plan should therefore analyze market needs and company's competitiveness.

3.1.3 Other risks

a) Natural disasters

The only way to treat breakdown caused by natural disasters such as earthquake, flood and tornados is insurance of the technology and buildings.

b) Economy, political, legislative and regulation changes

Political, economic, legislative and regulatory changes influence creation of support tools for EE and RES projects for example feed-in tariffs/green certificates for electricity produced from RES and combined heat and power generation; taxation policy; regulation of electricity and heat prices; focus of the state support programmes, energy prices, etc.

c) Social acceptance

Social acceptance of the RES utilisation and EE measures to be implemented plays important role during the planning phase as well as in the implementation phase. Investment projects require a valid building permission and positive environmental impact assessment. These procedures need acceptance by public as well as by the company staff. Human factor can strongly influence achieved savings during operation and maintenance. Therefore its important have a communication plan showing the effect of the project implementation and its energy, costs, environmental, social and other benefits to the public, to decision makers and/or to the company staff.

3.2 Project specific risks

With each type of RES and EE projects are coupled specific risks. This chapter is focused on highlighting additional specific risk coupled with implementation of different types of RES and EE projects.

3.2.1 Biomass projects

Implementation of biomass projects is typically coupled with large investments and medium to long payback period. Developers often prepare these projects for financing through grant resources with co-financing from own and/or commercial resources.

Biomass system operation and maintenance are work-intensive. Energy equipment based on biofuels is more operation-intensive than facilities using fossil fuels, with worse economy in long-term perspective or in area of regulation.

Interesting economy aspect of biomass systems are lower investment costs for creation of one work place in comparison to industrial projects with facilities using water energy or in petrochemical industry.

Main specific factors influencing the economy of the biomass projects are:

- Raw material availability (transport of biomass is economy effective up to 40 km) and existence and availability of infrastructure.
- Raw material quality (humidity, energy content, density, shape and size of biomass particulates and total ash content). Needed biomass quality is given by type of biomass/biofuel and way of its use (type of technology used) and strongly influences output, efficiency of the used technology and therefore profitability of the investment.
- Decrease of amount or quality of raw material (fuel) by the same price
- Price of biomass is influenced by several factors i.e. growing trend of its use and type of biomass used – primary biomass (residues produced from food-crops or forest crop growing), secondary biomass (produced in food and beverages industry, from saw mill and paper and pulp industry and etc.) or tertiary biomass (organic components of communal waste, waste from timber production, sludge, etc.). Less risky is generally tertiary biomass as its use is coupled with waste disposal. Long-term contracts can treat this risk and can at the same time offer traditional producers of biomass safe market for biomass.
- Size of the technology unit and type of applied technology (production of heat and/or energy, production of biofuels for transport).
- Size of the technology plays important role because is coupled with size of needed storing capacities for raw material, size of operation buildings and number of employees, etc.
- Sufficient storing capacities - minimum storage capacity should be for 1 heating season
- Estimation of operation and maintenance costs – costs for renting, personal costs, costs for fuel, etc. Operation and maintenance costs should include also additional costs coupled with type of fuel and technology used i.e. storage costs, manipulation with ash/inorganic residues, cost coupled with substrate for operation, repairs and maintenance costs of devices providing for pre-treatment (disintegration of fuel/organic wastes), costs coupled with steam consumption, oxygen consumption, gas treatment or compression.

3.2.2 Solar energy projects

Specific risks of solar energy projects are:

Technical risks:

- Correct selection of the capacity, size and type of technology
- Solar energy potential has to be analysed taking into account local climate conditions (solar intensity, ambient temperature etc), type of collectors, its efficiency and its total area, as well as needed heat/electricity output
- Risk of appropriate location selection - location must respect needs analysed during the feasibility study.

Financial risks:

- Correct estimation of investment costs (right dimension of the economically profitable size of the solar technology)
- Prices for solar technology are different according to country of its installation and are relatively expensive. Investment costs include besides solar collectors also costs for accumulation tank, pumps, ventilators, regulation elements, heat exchanger and other costs needed for system implementation incl. price for its installation. The optimal size of the technology and its investment costs should be analysed in the feasibility study.
- Estimation of price and amount of product (heat, hot water, electricity)
- Crucial for economic sustainability is the dimension of output as well as correct estimation of product price and identification of possible purchaser. Long-term delivery contracts can strongly reduce this risk.
- In case of photovoltaic projects where main product is electricity it is mostly needed to prepare study of power grid influence, which analyses costs for connection to grid and electricity purchase price.
- Correct estimation of operation costs. Operation costs should include energy prices for operation and control of the system, regular repairs, general repair and maintenance, subsidiary capital needed for covering costs to compensate external conditions e.g. damages caused by extreme temperatures or vandalism.

3.2.3 Geothermal energy projects

Preparation of geothermal project is especially demanding in terms of time and money, because accurate estimation of geothermal bore potential is necessary.

Specific risk of geothermal projects can be divided into two main categories:

Exploitation risk – connected to survey stage of project preparation

Mapping consists of different stages/phases - geological, hydro-geological, geophysical and geochemical. Geological and hydro-geological study plays important role by placement of the exploited bore, realistic model and implementation of the geothermal system and energy potential estimation. Geochemical survey (including isotopic geochemistry) is an effective tool for finding out whether water or steam is dominant in the geothermal system, determination of minimal temperature in expected depth, homogeneity of supplied liquid etc.

Financial risk – which results from construction of the facility

Time, size and financial costs of each step of construction are given by geothermal source characteristics. Potential of geothermal field determines size of the central unit and therefore specific costs. Obtainable flow of geothermal liquid determines number of needed bores and therewith also costs for preparation and its timetable. Costs for drill work and specific costs for equipment have significant influence on production costs and in consequence on cash-flow during the whole project lifetime. High risk is coupled with first phase of geothermal project development up to drilling phase. This is coupled with positive or negative results of bores and their high costs. Determination of costs for energy production should also include exploitation risks. These values can strongly increase price of produced heat /electricity.

- Estimation of operation and maintenance costs
- Analysis of operation and maintenance costs should include also costs for preserving technology against corrosive character of geothermal liquids, monitoring of continual degradation and/or catastrophic material and components damages, testing and planning of repairs of protective layers. Economic analysis should estimate operation costs as well as expected energy prices development

3.2.4 Wind power projects

Implementation of wind power plants requires knowing average wind speed in the selected location as well as its changes with time. Monthly and seasonal speed variation has significant influence on electricity production from wind power. Production of electricity is given by local wind distribution, wind density, size of rotor and technical solution. Estimation of wind power potential is crucial for estimation of electricity production and economy of the project.

The main factors influencing economy of the wind projects are:

Technical risks:

Development risk

- Development risks of a wind power project include risk of turbines placement and risk of ownership of the selected are of implementation.
- To minimise these risks the distances between turbines should be designed according to standards given by wind turbine producers. The selected areas of implementation should have clear ownership.

Risk of appropriate location selection

- Average annual wind speed in the selected location should be from 5,5 m/s and more.
- Selection of suitable technology
- Determine specifics and parameters of the selected area (density of air, prevailing wind direction according to the land relief) and going out of these data select correct type/size of the wind turbine.

Operational risk

- Operational risk should be treated by well prepared maintenance contract with guarantee of amount electricity production. Connection to grid can be restricted by the power grid operator, therefore it is important to prepare a study of power grid influence within the preparation phase of the project.

Financial risks:

- Electricity purchase prices (feed-in tariffs or green certificates) reduction and regulatory changes
- Estimation of appropriate investment
- Investment costs should include costs for connection to the grid and costs coupled with operation - costs for employees, insurance, renting, general and common repairs, maintenance costs and others.
- Social risk (social acceptance)
- Building of wind power plants require the process of approval – Environmental Impact Assessment (EIA), within also social acceptation is monitored. EIA is one of the conditions of getting the building permission. Therefore it is important, that developer organizes an information campaign for the public in the area of implementation on wind power technology, its economy and social benefits for the region and environmental impact.

3.2.5 Small hydropower projects

Technical risks:

Risks coupled with electricity production (geological and hydro geological risks), which can be lower than projected which can be caused by low quality hydro geological data.

Preparation of detailed geological analysis, analysis of existing flow rates of the selected area (energy potential is given by flow rate and gradient during the year) can strongly reduce this risk. These risks are common for developer, operator and local electricity distributor and have to be also defined in the delivery and purchase contracts of electricity.

Not achieving guaranteed parameters of the plant (output, efficiency, low lifetime, high costs for maintenance and costs for repairs of not expected damages and breakdown, etc.)

Preparation of high quality projects and selection of high-quality technology is needed. Calculate properly annual energy output and determine flow duration curve.

Operation risk

Clogging by solid parts and increase of accumulated sediments can cause decrease of accumulated water and possible electricity production. This risk include also untimely deterioration of the technology caused by direct contact with water, presence of erosive substances or chemical aggressiveness of water and aspects dedicated to incorrect operation, maintenance and repairs. Selection of prestigious technology, experienced construction and maintenance company can reduce the risk. These risks should be treated in contracts with your suppliers, construction and maintenance company.

Commercial risks:

High investment costs given by place of installation and character of the country

Investment costs should include: civil part (dam, inlet water channel, building part of the machine room); machinery part (turbine, generator, transformer, grid); other (engineering, ownership of the land).

Electricity sale prices (feed-in tariffs/green certificates) decrease

Market risks:

Implementation of the hydro power plant is often coupled with supplying electricity to local electricity market, therefore it is needed to have of long-term contract on electricity supply with local network distributor

Higher operation costs: operational costs are coupled with the need to meeting the conditions of ecological impact of the plant, therefore selection of appropriate area of implementation and appropriate technology with minimal impact on environment is necessary.

Decrease of electricity produced during the operation: Electricity production can decrease as a result of dry weather. Such decreases of electricity production can cause penalties for failing to supply the contracted amount of electricity or provision of subsidiary source.

Other specific risks:

Other risks are coupled with breakdown of the dam, breakdown by flood, earthquake, water infiltration, high water level, landslide and etc. Suitable technical solution, which considers this risk and which is connected to local geology, has to be chosen.

3.2.6 Specific risks of EE projects

As already mentioned, EE projects can be divided into two main categories: **EE in industry** and **EE projects in buildings**.

The first step by EE investment project development should be the energy audit. Energy audit (EA) is a tool, which helps the developer/company/heat supplier/building owner to evaluate energy efficiency of industrial process/equipment/building and proposes measures for its increasing. EA should be prepared not only with the purpose to determine possible energy savings, but it should also provide for compatibility of proposed measures with process needs and/or building status. Energy audit is a very good basis for further development of project and it is mostly required by commercial banks when by applying for financing. EA should be prepared by sector experts.

Specific risks coupled with EE projects are:

Technical risks:

- Decrease of facility efficiency with time and its technical parameters (i.e. decrease of boilers efficiency, degradation of insulation)

  EE of device, equipment or whole company should be in detail defined during the development phase of the EE project. Technical and EE characteristics changes of device during its operation is standard timely decrease which has to be taken into account by project design and technical characteristics decrease need to be connected with economy and financial factors of the investment

- Risk of not achieving declared savings is divided into selection, installation and technology operation.

  By project development an expert having experiences in specific application should make proof of the proposed measures performance. This proof should be made during energy auditing and needs at least minimal analytical evidence. Feasibility study prepared according to energy audit results should have at least two scenarios. Output of the feasibility should recommend the type of technology, its parameters, investment costs and quantify expected savings. Feasibility analysis should also consider factors influencing EE of installed technologies.

- Change of initial parameters and characteristics of energy flows (fuel, compressed air, heat and output).

  It is necessary to take into account future plans of the company (i.e. widening or reduction of some parts of the company production).

Operation risk

- Operation by partial loading, modification of operation hours of different type of facilities is coupled with decrease of installed production capacity of the industrial company. This operation risk can be minimised by closing long-term contracts with specialised companies, which provide for services, repair and/or operation of devices

Financial /commercial risks:

- Ability and willingness to pay, project returns

  It is crucial to minimize this risk by selection of partners and structure of payments. Economic analysis should guarantee positive cash flow, so that total payment for debt service is smaller than the cost savings.

Market risk and competitiveness

- Specific commercial risk of an EE project in industry is the market risk and competitiveness. FIs mostly ask for future prediction of company cash flow, well prepared business plan with predicted returns and analysis of market demand. Declaration of long-term delivery contracts with your customers can strongly influence credibility of the project by its profitability analysis.

Other risks:

- Corporate risk (structure of shareholders)

  Corporate risk increases with number of shareholders; decision making process is generally lowlier with high number of shareholders.

Social risk

Acceptance of designed measures by public, staff, building users and etc. plays an important role in achieving planned energy savings. Human behaviour during operation and maintenance of EE technology/building plays also important role and has impact on lifetime and energy performance of the applied technology/measure. It is important to raise awareness of the importance of EE measures, motivate employees, organise training courses for employees especially if new innovative devices should be implemented.

4. Legislative support of EE and RES projects

European Commission has adopted a number of legal instruments for the support of more efficient use of energy and higher share of renewable energy sources.

The basis for a European Energy Policy has been set out by a major new “European Strategy for Sustainable, Competitive and Secure Energy” **Green Paper** on energy efficiency or doing more with less. The paper sets a clear goal to prioritize energy efficiency, with a goal of saving 20% of the energy that the EU would otherwise use by 2020

Concrete goals for RES utilization are sets by **White paper**. This strategy paper sets goals in each relevant RES field with justification and assessment of the costs and benefits. The overall indicative goal is 12 % share of renewable energy in primary energy consumption of EU by 2010.

The main tools of the EC for achievement of EE and RES target on EU level are:

- Program **Intelligent Energy Europe**
- In area of research and development **Framework Programs;**
- In structural policy **Structural Funds**

Important European policy instruments – directive are the following:

Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market.

Directive 2002/91/EC on the energy performance of buildings

Directive 2004/8/EC on the promotion of cogeneration based on a useful heat demand in the internal energy market

Directive 2006/32/EC on energy end-use efficiency and energy services

Directive 2003/30/EC on the promotion of the use of biofuels or other renewable fuels for transport (Share of biofuels by 2010 : 5,75 % - EU average, in terms of total energy content)

Based on respective directives individual member countries adopt national laws and create national support programs.

4.1 Czech Republic

4.1.1 Investment subsidies

EE and RES projects can receive an investment subsidy if they meet certain criteria; this type of support is not mandatory and the actual amount granted depends on the project quality and competition between projects in the same category.

The EU structural funds are managed by the Ministry of Industry for business companies and by the Ministry of Environment for public companies and NGOs. The new program for 2007-2013 has just started and the selection criteria have not yet been approved. According to preliminary information from the Ministry of Industry in its program Eco-Energy, the highest priority will be set to energy savings, cogeneration and electricity production from biomass and biogas and hydro. On the other hand, electricity from wind and photovoltaic plants will probably get a low priority because they are regarded as unreliable and have a negative impact on the distribution network, which could in practice mean no availability of investment support.

4.1.2 Support during operation

The law No. 180/2005 on “Support of electricity production from RES” sets the legal base for guaranteed feed-in electricity prices for RES based electricity. The tariffs are set by the Energy Regulatory Office for each year with different values for each type of RES. The price is guaranteed for the period of 15 years following the year of commissioning. The producer can choose between two regimes of selling the electricity:

- guaranteed prices; or
- green bonuses

In the first case electricity is purchased by the distribution company, in the second case the producer sells electricity on the market and gets compensation from the distribution company for green bonuses. For some types of production (e.g. co-firing of biomass with fossil fuels) green bonuses are the only option. The extra costs for the support are evenly distributed over all electricity consumers as a certain item in the regulated part of electricity price.

4.2 Slovakia

4.2.1 Investment subsidies

Currently investors in EE and RES projects are waiting for possibility to apply for subsidies from structural funding. Within the next programming period 2007 – 2013 should be allocated investment subsidies from structural funding within Operational Programme Competitiveness and Economy growth and OP Environment. Here main priorities are improvement of air quality and thus harmful emissions reduction with focus on environmental friendly fuels and energy sources utilisation and higher RES utilisation.

Share of national co-funding and equity co-funding of projects is not specified yet. In general, maximum ERDF / ESF support for all operational programmes is 85%.

Another source of financing is EEA Financial Mechanism and Norwegian Financial Mechanism. Currently the business sector is waiting for new call for proposals, which should be published in autumn 2007.

State support to environmental protection is provided by the Environmental Fund. Support is provided as subsidy (for public sector – mainly municipalities) or soft loan (for private sector). Supported are activities focusing on meeting targets of State Environmental Policy, mainly in air protection and ozone layer protection, water protection, waste management and nature protection (e.g. RES investment support).

4.2.2 Support during operation

Decree (Decree of the RONI No. 2/2005 and No. 2/2006) about fixed RES-E prices is being issued by RONI annually for each one year and it is conditioned by the Guarantee of origin. The application process for prices regulation for the next year is being repeated annually. This approach enables RONI to adapt other regulations, mainly regarding distribution companies which will purchase RES-E and due to fact that the purchase of RES-E is not obligatory in Slovakia.

The tariffs are set with different values for each type of RES. Fixing of tariffs for one year is a too short period to provide adequate incentives to use and invest in RES. Conclusion is that many RES projects are economically and market viable (in present conditions) but the potential threats of unknown future development create high risk level which is not acceptable for providing bank loans. Clear recommendation is to publish new law for support RES which will guarantee stable log term framework for RES investments.

4.3 Lithuania

National Energy Strategy anticipates (renewed every five year, last version adopted 2007 01) the use of RES in Lithuania up to 12% in the primary energy balance by 2010, where 7% of electricity production comes from RES. National Energy Efficiency Program (renewed every five year, last version adopted 2006 05) is an instrument for implementation of actions related to energy saving and utilization of local and renewable energy sources. Law on Electricity, as well as The Regulations for Public Service Obligations and Procedure for the Promotion of Purchasing of Electricity Generated from Renewable and waste energy sources (adopted 2001, last amendments 2004) provides encouragement by the State of producers to generate electricity using renewable energy sources of various RES technologies. The promotion shall be carried out with respect to wind power plants, biomass power plants, solar power plants and with respect to hydroelectric power plants, when aggregate capacity from all generators of such a hydroelectric power plant does not exceed 10 MW. Wind power plants whose aggregate installed power of all generators is greater than 250 kW shall be constructed in the zones in such a way as not to exceed the maximum aggregate power limits specified for each zone and the overall maximum installed capacity of 170 MW of all zones. Pursuant to the Regulations for Public Service Obligations holders of the supply license and public supply license are obligated to purchase all electricity generated using RES from its producers at the established prices and sell it to their customers. The Regulations for Public Service Obligations provides the obligation for the supply network operator to ensure priority transportation of electricity generated from RES via electricity transmission networks in the situation when the grid has limited conductivity.

4.3.1 Investment subsidies

The most important fiscal measures which have an impact on enhancement of EE and RES are EU Structural Funds. EU Structural Funds (2004-2006) through measure "Ensuring of Energy Supply Stability, Accessibility and Increased Efficiency" have provided support for investments into Energy Efficiency in Public Sector, Energy networks, Boilers upgrade and fuel conversion, Utilization of local and renewable energy resources. EU Structural Funds (2007-20013) plan to provide support for programs Energy networks and Increasing of energy production and use efficiency as well as utilization of RES.

Namely for EE Stats Multi-family housing building modernization Program (adopted 2004 09) have the following financing scheme designed for the implementation of housing renovation and modernization projects:

- Home Owners Association funds (at least 10 % of the investment amount);
- Municipality support (until 15% for audit, technical design and implementation);
- Government support (until 50% for implementation);
- Commercial bank loan.

Namely for RES generators whose power plants are using renewable energy sources for the electricity generation are subject to a 40 % discount for the connection to the network of operating energy plants.

4.3.2 Support during operation

As from 2001, feed-in tariffs have been applied for the purchasing of electricity generated using RES. There is fixed purchase process according to quota up to year 2010 or sometimes longer. There is such price for: Wind energy – 0,22 LTL/kWh; Hydro energy – 0,20 LTL/kWh; Bioenergy – 0,2 LTL/kWh. (1 EUR = 3,4528 LTL). From 2010 revised promotion system of tariffs will be maintained until 31 December 2020.

Physical and legal persons, upon presentation of documents proving consumption of biofuel in mobile pollution sources shall be exempted from the payment of the pollution charge for emission of air pollutants which emerge during combustion of biofuel.

The electricity shall be exempted from excise if electricity is generated from RES (This provision will come into force since 1 January 2010).

4.4 Latvia

4.4.1 Investment subsidies

The most important type of grant available at national level in Latvia is the EU structural funds. EE and RES are mentioned as a supportable activity in one of the SF programs only provided by ERAF "Siltumapgādes sistēmu modernizācija atbilstoši vides prasībām un energoefektivitātes paaugstināšana gan siltumapgādes sistēmas ražošanas un sadales pusē, gan gala patērētāja pusē". (Modernization of heat supply system according to environmental requirements and energy efficiency improvement from both generation and distribution side of heat supply system and end consumer side.) Unfortunately application for this program ended on November 2005. EE and RES projects are not in the list of other priorities and therefore not directly eligible for granting. For some specific EE or RES project it is possible to apply for structural fund grants, but under different categories, like for example improvement of infrastructure. Information about financing possibilities in the new planning period (2007-2013) will be available in the EU SF homepage http://www.esfondi.lv. It is worth to keep looking at the web site for having most updated information on the type of project financed by EU structural funds in Latvia.

4.4.2 Support during operation

Energy Development Conception, approved on August the 1st, 2006, is a policy-planning document that establishes Latvian state energy policy, objectives and actions for the next 10 years and indicates the long-term development route. The main activities will be addressed to energy efficiency improvement in district heating systems and buildings and energy production with renewable energy sources.

Important regulation concerning Energy efficiency and renewable energy projects is the Regulation on electricity production in cogeneration cycle, this regulation, approved on November the 6th, 2006, gives the criteria of qualified cogeneration plants that can sell the electricity in the framework of mandatory purchase; the price determination criterion is based on the capacity and fuel type. The regulation sets for small scale biomass cogeneration a more advantageous mandatory purchase tariff. [noteikumi par elektroenerģijas ražošanu koģenerācijā (MK noteikumi Nr.921, 6.11.2006)].

For other renewable energy source currently there is not a support during operation.

4.5 Estonia

Estonian governments program is to ensure Estonian energy needs and independence. Estonian government is a three party coalition and their primary goals in energy sector are:

1) start updating the Fuel and Energy Sector Long-term Development Plan in 2007;
2) support the production and use of renewable energy, including bio-fuels and the transition to dispersed production;
3) develop international cooperation in renewable energy in the field of technology development as well as energy trade;
4) start mapping the renewable energy resources and evaluation of potentials and an analysis of the cost-effectiveness of the technical solutions; commission a national renewable energy environmental impact assessment and thematic plan;
5) draft the terms and conditions of competition for companies to participate in the business of renewable energy in state-planned and state-owned areas;
6) in 2007 adopt the Energy Research Programme for Promotion of Sustainable Consumption of Energy and Reduction of Energy Losses 2007-2013 and adopt the Energy-conserving Home Support Programme by 2009;
7) participate in establishing the single European electricity market. Support the integration of the Estonian energy system into Scandinavian energy systems and apply the infrastructure support funds of the European Union for funds for establishing connections ensuring energetic security in the Baltic Sea region;
8) ensure the operation of the transmission network of Eesti Energia as an independent system operator;
9) support an open electricity market. Make preparations for opening and open the electricity market as of 2009 to the extent of 35% and as of 2013 to the extent of 100%;
10) decide on participation in nuclear cooperation with Lithuania and Finland based on consensus among the parties to the Governing Coalition, carrying out thorough environmental impact assessments and research before making the final decision, comparing the long-term cost-effectiveness of nuclear energy with other energy sources. The entirety of the research information shall be published and a public discussion shall be organised before making a decision.

Also Estonian government and Parliament have approved different programs, strategies, laws and regulations regarding the energy sector. The main are:

- Long term public fuel and energy sector development plan;
- Electricity market act;
- The grid code;
- District heating act;

4.5.1 Investment subsidies

For smaller investments, such as renovating apartment buildings the government has made an organization called KredEx, which is managed by the Ministry of Economic Affairs and Communications. KredEx helps to alleviate housing-related financial problems and preserve the existing housing stock in Estonia. A way to alleviate financial problems is to give grants and loan guarantees. The grant covers up to 10% of the cost of the renovation costs. The mentioned costs are: renovation/reconstruction of the main structures; renovation /reconstruction of electrical systems and gas installations. Also there is a grant for technical inspection of apartment buildings. Guarantee loan is meant for associates, who can not receive the required amount of money from a bank, in which case KredEx helps them.

For larger type of investments the Ministry of Finance has created an organization called Environmental Investment Centre (EIC). The main activities of EIC are:

- Using the money gained from the usage of environment to the development of national environmental projects
- Filling the assignment of the Implementing Agency for European Regional Development Fund project
- Filling the assignment of the Implementing Agency for the European Union Cohesion Fund projects
- Offering long-term loans to environmental projects

EIC offers funding for different types of environmental projects, including energy efficiency projects. Applications for funding is possible to apply three times a year and dates are announced one month before the start. EIC also offers funding thru European Regional Development Fund for renewable energy projects. Funding for different types of projects varies, also the amount of funding and the cost of project.
Also one important task for EIC is to offer loans for environmental projects, which also include energy efficiency and renewable energy projects.

4.5.2 Support during operation

There are different support options for various projects. For example support is possible for biomass projects, growing crops or buying equipment. Also there is support for wind power: 0,0734 EUR per KWh and that is up to production of 200GWh, 0,0543 EUR per KWh plus 0,0159 to 0,0287 for KWh (this figure depends on the market price of oil shale energy production) – up to 400GWh. After reaching 400GWh the investor is being paid market price and the possibility to sell green certificates to different companies.
Also as mentioned above, the government is working on different schemes to support the use of EE/RES projects, but at the moment support is more possible to apply for wind power and biomass projects.

5. Lesson learnt in financing EE and RES projects

This chapter describes the actual situation in each participating country with potential types of projects and main problems/barriers encountered in providing financing of EE and RES projects. 5 case studies per country of concrete successful projects with closed financing or in promising situation are also provided projects (Attachment I.).

5.1 Czech Republic

5.1.1 Specific comments to individual types of EE and RES projects

Energy efficiency projects

The opportunities and potential of EE measures both in industry, businesses and in public sector are still large. Implementation is however hindered by relatively long payback times. A very positive factor is a combination of EE and RES measures thanks to which the project has higher chances of receiving an investment subsidy.

Biomass

Biomass is most suitable for heat-only production; however several projects were implemented recently with heat and power capacity using a small steam turbine or organic Rankin cycle units. After the introduction of favourable guaranteed price of electricity some power plants started to use woodchips in co-firing mode about 3 years ago, which lead to increase of cost of this fuel negatively affecting small installation; now the price of electricity in co-burning mode is less favourable.

Biogas

A great number of new projects have been started recently using waste materials and agriculture products.

Hydro power

Support with the guaranteed electricity purchase price is applicable only to plants with installed capacity up to 10 MW. There is a very limited number of suitable locations for new installations. For older existing plants the legislation encourages through of higher guaranteed price the rehabilitation of the electrical part which results in better control characteristics.

Wind power

There are only few suitable location, mostly in areas with insufficient capacity of distribution network.

Solar energy

Photovoltaic projects just started to appear, a couple of projects have been realized with the support from the previous program of structural funds. Future investment subsidies are uncertain.

Geothermal energy

There are no suitable locations for electricity production. Conditions with warm ground water enabling are realization of larger projects utilising geothermal heat for heating purposes are rare; only very few such projects have been installed.

5.1.2 Financing

The acceptance by commercial banks of RES projects has improved since the new legislation supporting RES based power generation is in place. However, still the basic condition for a success is a well prepared project with a technical design based on reliable site data and detailed economic analysis. A very important condition is sharing the risk. The investors are usually not in the position to finance a bigger portion from their own sources, getting a subsidy from public funds is therefore very important. In the current situation (mid-2007) all potential investors with new projects concentrate on preparation of design documents and elaboration of applications for subsidy. Negotiations with the banks can be finalized only after the distribution of subsidies in this first round of the EU 2007-2013 program has been decided, which can be expected by end of 2007.

5.2 Slovakia

5.2.1 Specific comments to individual types of EE and RES projects

Energy efficiency projects

EE projects have large potential in industry, public and private sector. The main components of energy consumption in industry in Slovakia are space heating and process energy. The increasing prices of conventional fossil fuels increased interest of industrial companies to implement EE measures. Typically for financing of these projects is restricted availability of financial resources to small and medium enterprises, lack of equity lack of capacity to prepare these investments.

Important share of energy use present buildings. In the last years with increasing prices for electricity and consumption upraises investments into thermal insulation of buildings, replacement of windows and regulation of heating system especially in residential sector. Further increasing of EE and RES measures implementation especially in public buildings is to be expected by implementation of Energy Performance Building Directive.

Biomass

Biomass is the source that has the largest technical potential (46% of all RES), followed by geothermal energy (26%) and solar energy (21%). The technically exploitable potential for wind and small hydropower have respectively a share of less than 3% and less than 5% of the RES technical potential.

Households and SMEs have started to use RES (mainly biomass and solar energy) as a economical option after the sharp increase in prices of fossil fuels (many final consumers replaced boilers for natural gas wit new boilers burning wood and wood derivatives, pellets and briquettes); the same has happened for agricultural units, which have started to use self produced biogas. In industry and district heating is increasing number of project switching from coal to biomass and gas and co-firing of coal with biomass, Biogas projects

A great number of new projects have been started recently using waste materials and agriculture products.

These projects are coupled with complicated and log-term process of approval (building permit, EIA, technical conditions on connection to grid). Ownerships of the land area is complicated because in SR is ground disintegrated in small parcels with more owners. There is lack of experiences with long-term contracts on delivery of biomass; farmers do not want to guarantee long-term supply. Feeding tariffs for electricity produced from RES are not long-term guaranteed.

On the market is lack of technology suppliers, which are able to guarantee “delivery on key”, lack of experiences with the biogas technology. Competitiveness between cultivation of food and energy crops – subsidies are changing each year and therefore is changing the attractivity of individual crops.

Wind power projects

Only areas with the best wind conditions are suitable for the effective use of wind energy and these are only in a small fraction of the territory of the Slovak Republic (the installation of wind power plants in national parks is impossible). Under the current conditions, electricity production from wind energy is expected to reach 200 GWh by 2010.

Private companies with foreign ownership (mainly Austria or Germany) have started the development and installation of wind parks in Slovakia.

Implementation of wind power plants are coupled with country specific risks i.e.: disintegration of ground into small parcels; time consuming and complicated process of EIA; need to order technology 1-1,5 year before implementation (need of advance payment in amount of 15 to 25% of the investment costs; high investment costs, relatively low price of conventional energy (coal and nuclear power).

Hydropower projects

SHPP are not sufficiently addressed by the regulatory or legal framework in Slovakia in particular the standards for the construction of small hydro power plants. Electricity generated by SHPP are guaranteed only for one year.

Solar-thermal projects

The most likely applications of solar thermal energy in Slovakia are estimated as follows:

Households: solar thermal domestic hot water and additional heating in family houses;

Housing associations: solar thermal domestic hot water in apartment buildings;

Public and commercial services: heating of domestic hot water in lodging, sport and recreation facilities; heating of technology water (swimming pools);

Photovoltaic systems

Due to high initial cost and low feed-in tariffs fixed for only one year, the use of solar energy for electricity production is inefficient at present.

5.2.2 Financing

The acceptance of RES and EE projects by commercial banks has improved since the new legislation supporting RES based power generation is in place. However, still the basic condition for a success is a well prepared project with a technical design based on reliable site data and detailed economic analysis. A very important factors are applicant's shortage of own capital resources, sharing the risk and current regulatory framework.

Current situation in mid of the year 2007 is that developers wait for calls for proposals to get subsidies and to cover at least part of their initial costs. In consequence implementation of projects is very slow, because approval and administration of structural funding and other grant resources is time consuming.

5.3 Lithuania

<u>Energy efficiency projects</u>

EE projects have the most opportunities and potential in the residential, public and industrial sectors. For residential sector Multi-family housing building modernization Program have the attractive financing scheme (subsidies > 50%, competition amongst the banks for loans). Main barrier is decision making procedures of dwellings residents, lack of contractors. Public sector have single-purpose EE programmes or projects (schools, hospitals, administrative buildings), but mostly investment is limited. Not for all cases public institutions are able to keep a part of the economic savings from energy efficiency measures for the first years after the investment. Further, institutions should always purchase equipment with the highest efficiency, or at least the highest cost-effective efficiency. Positive role could make implementation of "buildings directive": until summer of 2007 155 specialists for certification of energy performance of buildings are attested, 80 building certificated. The industrial sector significantly increases attention to EE projects, partly due of emission trading implementation.

<u>Biomass</u>

The plant biological mass (wood, straw, energy plants) is one of the most significant RES in Lithuania, that comprises the important part of the local fuel. The forest coverage 32,5 % of land area. Only 1 % of the straw resources are used for energy needs. There are several Lithuanian companies manufacturing straw combustion equipments. However, the straw use as fuel increases slightly, due to the following reasons: relatively expensive straw combustion equipments; big investments to infrastructure: straw collection, pressing and transportation; large rooms and secure storage of straw. Today the market for wood chips and other wood residues is growing. Significant obstacles for local use of biomass: export to more developed EU countries; increasing of price for wood waste. The scheme of financial support for the growing of energy plants (grasses and agricultural crops) start from summer of 2007 (45EUR/ha).
Power production from local and RES is promoted and bought for 0,20LTL/kWh, which is twice more expensive than fossil fuel based CHP plants sell, and 3 times more than the Ignalina NPP.

<u>Biogas projects</u>

Biogas is produced in two wastewater treatment plants, in a distillery and in a agricultural company. Previous experience with biogas in Lithuania shows that capacity to operate and maintain biogas plants need to be built in Lithuania. Landfill gas plants have lower investment per MW than biogas plants. A political decision to use landfill gas should be part of the

Lithuanian climate change plan. Support for construction of biogas plants should be introduced, including preferential loans.

Wind power projects

Wind resources suitable for power utilization are available more than on 10% of the territory in the western region of the country. There is also potential for offshore wind power development in the region, however there are no current plans for offshore wind power. Currently 56 MW of wind capacity is installed. By 2010, 200 MW of wind turbines will be installed. Main barriers: during two years investment cost is geminated; the banks credit only projects until 15 years pay back time. The dispute about new subsidiaries tariffs is initiated.

Hydropower projects

The small scale hydro power stations (total capacity is 14,8 MW with an annual electrical energy production of 0.04 TWh) are commercial and profitable through subsidiaries tariffs. Due of environmental protection reasons the development of hydropower projects is not envisaged.

Solar-thermal projects

The use of solar energy is poorly developed in Lithuania. The climatic conditions are not favourable for using solar energy, and therefore the solar energy resource potential is small. There are rare examples of installation, but not any scheduled incentives or projects in the field. Recently solar energy has been utilized for hot water supply, space heating of premises and drying of agricultural production. Preliminary estimations show that passive solar system could save about 15-20 percent of energy demand for space heating of buildings.

Photovoltaic systems

Small amounts of solar cells and autonomous electricity sources (until 3 kW) are produced in Lithuania. The plants have been implemented only as demonstration projects in the universities and schools. The power of this origin has formally subsidiaries tariffs, but due to high initial cost is not expected to develop it until 2010.

Geothermal energy

The geothermal areas cover 80 percent of Lithuania. There are extensive geothermal energy resources in the West region of Lithuania. The feasible potential of geothermal energy is at 0,8 TWh/year. Geothermal energy is already in use in Lithuania. The operating Klaipėda demonstration geothermal plant with looped circulation system is the only of this type in the Baltic Region. The overall capacity of the plant is 35 MW (13.6 – geothermal and 21.4 from subsidiary peak boiler). The results of the Klaipeda geothermal heating station have not been promising, partly due to lack of planning and disputes with the district heat supplier. The lessons from this station are that geothermal heating must be planned well, and that the heat distributors must be included in planning and operation. Development of geothermal energy is included in the National Energy Strategy and in National Energy Efficiency Program, but actually is not attractive economically. The use of heat pumps starts to have significant development for heating and hot water of single family houses. Main obstacles are relative expensiveness of projects.

5.3.1 Financing

The commercial banks during last three years increase attention to EE and RES projects. Actually the strong competition is among the 6 commercial banks for participation in the Multi-family housing building modernization Program. The Program has attractive insurance and risk sharing instruments. Same risk sharing effect are common in the practice by linking projects financing through own capital recourses, structural funds and commercials banks loans. Actually interest rate is favourable for commercial loans (<6%).

5.4 Latvia

Energy efficiency projects

The opportunities and potential of EE measures both in the industrial, public and residential sector are very large. However, the lack of a law on energy efficiency leaves uncertainty and does not provide any regulatory incentives to implement energy efficiency projects.

In the industrial sector, for large companies, emission trading for the period 2008-20012 could become an interesting incentive to implement energy efficiency projects (and renewable energy). Until now projects implemented in the industrial sector are more oriented to replacement and refurbishment of production lines and increase of capacity output and energy efficiency is only in some case a side effect.

On the other hand, SME enterprises are facing very typical problems in financing EE and RES projects, which are already described in chapter 4.

In the district heating (DH) sector there are very good possibilities to increase energy efficiency by installation of cogeneration units. However such kind of projects has been implemented only in very few cases. From one side, the main reasons have been the lack of legislative support measures and clear institutional framework, while form the other side long payback period of the projects. Then, for several district heating schemes, in particular those managed by municipalities, low awareness about energy efficiency at management level is still a great barrier to improve energy efficiency operation of DH system. Project in relation to replacement of DH pipes have received support both from structural funds and from state programs.

EE project regarding public building are mainly implemented in the framework of state support programs.

In the residential sector, there is a particular legal barrier in relation on finding a common agreement between several flat owners of a building for implementation of EE measures. This problem in Latvia represents one of the main barriers to the implementation of energy efficiency measures in buildings. There have been cases where the disagreement of a single flat owner has stopped a project. Typically, if the building is managed by a cooperative, investment in energy efficiency measures are easier and agreement between house owners is easily managed.

Biomass

Biomass is mainly used for heat production and in form of wood chips and wood logs from the wood processing industry. There are very few biomass CHP projects.

Currently, in particular due to high export of biomass to Nordic European countries, there is a general lack of raw material or its price reduce investor interest in biomass projects like fuels switch or CHP.

Hydro power

The hydro power sector (in particular for small scale hydro power stations) is rather saturated in Latvia and previous support schemes have not been re-confirmed.

Wind power

In Latvia there are good and suitable locations, in particular on the costs line (both on-shore and off-shore) that have not been exploited. The main barriers so far have been legislative and in relation to licensing and permitting. Recently several investors have shown high interest tin developing wind farms and the new coming legislation should give a better framework.

Solar energy

There are not any subsidies for solar energy in Latvia. On commercial basis there have been only very few project regarding solar system for domestic hot water preparation in family houses. Other solar thermal projects and photovoltaic projects have been implemented only as demonstration projects financed with grants and R&D programs.

Geothermal energy

There are not suitable locations for direct electricity production. A potential geothermal location with waters at moderate temperatures is in Dobele region – but deep investigation and feasibility studies on the area have not been carried out.

The use of heat pumps is becoming quite popular for heating of single family houses.

5.4.1 Financing

The acceptance by commercial banks of RES and EE projects has improved in the last years thanks to a number of European and International programs and increasing of interest in the energy sector. However there are mainly two commercial banks in Latvia with specialised personnel in assessing energy efficiency and renewable energy projects.

The basic condition for a successful application to commercial financing is a well prepared projects with a technical design based on reliable site data and detailed economic and financial analysis.

Currently, an extremely important factor is the availability of public fund, in particular structural funds, for project co-financing. Several project developers are linking project development to application to structural funds, in particular in the district heating sector.

5.5 Estonia

Energy efficiency projects

Energy efficiency in Estonia is widely know and recognizable by companies and by housing associates. Unfortunately the more active side is housing associates, who implement EE because of their own well being- better inner climate and low energy costs. Even though companies know the possibilities and they have been informed constantly by ESB and by the governmental organizations thru newspapers and seminars, the EE sector in companies is poorly implemented.

A possibility for improving EE in industrial sector is very big, there are still a large number of companies with depreciated machinery and who use boilers with low efficiency. Also replacement or refurbishment of different electrical motors will provide a significant change in electricity use. Unfortunately support for companies is very poor, only unique and outstanding projects may receive funding from the Environmental Investment Centre.

EE measures are more widely represented in housing associates. In 2009 Estonia has to start using energy certificate for buildings, thus the renovation of old buildings should increase in the following years.

Biomass

Nearly half of Estonians soil is covered in forests and quarter is covered in agricultural fields. Biomass is currently mainly produced only from wood and – waste resources. Agriculturally biomass is not widely spread. Rape seeds and grain are mostly used for food and feed for animals, no fibre production. Necessary land for production is available, but it requires a certain market to whom to produce.

For new and alternative use of energy is mainly stuck behind poor research in implementation and in feasibility study. The studies would help in making the necessary decisions. Since the technologies are expensive, the investors have difficulties in finding necessary sums for the investment.

On the other hand biomass is predisposal because of the constantly rising energy prices for fuel. Also government is supporting the production of biomass, for example support for buying devices and machinery. Support depends on the fertility of the soil and the way money is used for.

Hydro power

The number of rivers and streams in Estonia is over 7000, but unfortunately most of them are short and with a low flow. Approximately 400 rivers are longer then 10km and only 9 have length more then 100km. Only 14 rivers have flow over $10m^3/s$. Thus Estonian hydro power potential is very small.

If hydro power would be installed in all possible locations, then would produce 0,1…0,2 TWh electricity annually, unfortunately there would be different legal and environmental aspects to worry as well.

Support for hydro power can be possible thru Environmental Investment Centre, but most investors do not see profit in hydro power projects.

Wind power

Wind power is one of the most widely used renewable energy sources in Estonia. Currently there are 32MW of wind turbines installed and by the end of this year the number should change.

Support for wind power: 0,0734 EUR per KWh and that is up to production of 200GWh, 0,0543 EUR per KWh plus 0,0159 to 0,0287 for KWh (this figure depends on the market price of oil shale energy production) – up to 400GWh. After reaching 400GWh the investor is being paid market price and the possibility to sell green certificates to different companies.

Solar energy

Solar energy use and support in Estonia is very poor. Solar energy in Estonia is mainly used on individual houses and on lighthouses. Solar energy in Estonia could be implemented during summer period, because winters have only 5-6 hours of daytime and mostly clouded.

Geothermal energy

Geothermal energy in Estonia is currently not being used. Few companies have declared their researches, but no major breakthroughs have been reported.

Since geothermal energy projects are not widely applied in Estonia, then support from EIC would be more likely, but the investor would have to prove projects profitability.

5.5.1 Financing

Financing from different banks is possible to receive; also this applies to different loan guarantees. Banks in Estonia unfortunately do not have a specific product for EE/RES projects. If the project is profitable for the investor and the bank sees low risk then financing is possible, that is a simple rule in Estonian banking. For larger projects financing for RES projects is more widely recognized by banks (for example wind power projects), for smaller projects EE is also very important for banks (for example loan for housing associates).

6. Conclusions

The opportunities and potential of EE measures and RES utilisation are still large in private as well as in public sector. The acceptance of RES and EE projects in commercial banks has improved during the last years as a follow of new legislation supporting RES based power generation is in place in most of the CF-SEP partner countries. The policy and regulatory framework has strong influence on preparation of bankable projects.

However, still the basic condition for a success in commercial financing is a well prepared project with a technical design based on reliable site data and detailed economic analysis.

Implementation of EE and RES is still hindered by relatively large investment needs, long payback times, applicant's shortage of own capital resources and capacity of sharing the risk. Therefore investors are interested to cover at least partly their investment costs from public funds.

This fact resulted also in situation that large number of projects has been prepared for financing during the CF-SEP project but most of them still wait for partial financing from structural funding.

However, the CF-SEP project addressed main barriers of commercial finance by preparing 25 bankable projects for their implementation, by publishing financial resources manual and best practice manual and bringing information on financing possibilities and best practices directly to the investors. Through bank trainings in all partner countries the project addressed the current credit culture of RES and EE investments appraisal of commercial banks. Through common dissemination activities, the project brought together financing institutions and developers and enabled discussion of crucial point in financing EE and RES projects as well as in their technical implementation.