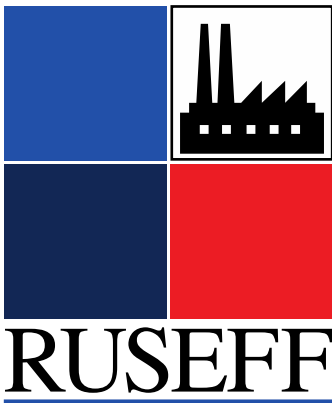


Russian Sustainable Energy Financing Facility

BEST PRACTICE GUIDE FOR ENERGY EFFICIENCY PROJECTS

April 2011

Contents

Abbreviations and Acronyms

CHP	Combined heat and power production (go-generation) also mentioned as TEZ
EA	Energy Audit
EE	Energy Efficiency
GHG	Greenhouse Gas
IRR	Internal Rate of Return
NPV	Net Present Value
PB	Partner Bank
RE	Renewable Energy
REUP	Rational Energy Utilisation Plan
ROI	Return on Investment

Annex 1

Standard Cash Flow Calculation

INTRODUCTION

Most republics of Central and Eastern Europe used to be part of a planned economy, which provided vast supplies of energy resources at much lower prices compared to those globally. However, the situation has changed drastically in recent years due to significant changes in political and economic life. Intensive increase in energy prices in recent years is the reason for the majority of problems not only in the energy sector, but in entire country economies as well.

Efficient use of energy is the most important and economical, but at the same time also the most underused and misunderstood way of increasing the profitability of any enterprise. Energy efficiency basically means doing more with less energy – irrespective of whether the notion is defined by engineers, financiers, owners, or politicians.

Still one great obstacle to energy efficiency is the lack of good structured information, about the benefits and applicability of energy efficiency as a means to achieve sustainable cost savings, profits, as well as social and economic improvements. Many technical specialists know what and how (technically) can be improved in their respective systems, but they have no idea how to convince their management to consider significant investments required for those improvements. As the management and owners of an enterprise are often business oriented, it sometimes could be advantageous to know where and how to get financing for an energy efficiency project, even if they do not understand its profitability.

The EBRD RUSEFF Facility helps to bring together the critical technical and financial components required to facilitate and/or add value to sustainable energy investment opportunities.

The guideline has been developed for companies, which would like to invest in energy efficiency to use the energy saving potential. It is very practice-oriented and provides companies with a general overview of EE projects and how to define and finance them. It was written to help professionals interested in the energy efficiency of their enterprises. It shows the enterprise owners and financial officers how to assess an energy efficiency project, how to put together a successful energy efficiency business plan, to make an educated conclusion on whether those opportunities are economically attractive for both the company and a lending institution (e.g. a bank) and if they are bankable.

Further it describes how to apply for financing. This financial advice is applicable to the enterprise's relations with any bank, but they are also particularly tailored to use the RUSEFF energy efficiency program run by the European Bank for Reconstruction and Development in Russia. On RUSEFFs website you will find some further tools for selecting and calculating EE-measures. For this please refer to www.ruseff.com.

1. ENERGY EFFICIENCY PROJECTS: MAKE YOUR ENTERPRISE MORE PROFITABLE AND COMPETITIVE

In any enterprise, there are many opportunities for energy efficiency improvements. They differ in the size of required investment, and in the investment return time. They may take different approaches – technological, or behavioural, but all of them have something in common – if carefully identified, planned, financed, and executed, they will make your enterprise more profitable, more stable, and more competitive.

1.1 Typical Measures for Energy Efficiency Investments

It is stressed that each energy efficiency investment proposal should be studied according to its own particular circumstances. There are a number of 'Typical Sets of Measures' that should be considered when planning investments.

- **Lighting Case Study:**

Replacing of mercury lamps with light-emitting diode lamps at the meat factory (RF Central Region)

A company would like to replace inefficient mercury lamps with light-emitting diodes. This will save a huge amount of electricity consumption by the lighting system (up to 75 %).

Items	Before replacement (base scenario)	After replacement
Number of lamps	100	100
Lifetime, h	10,000	100,000
Illumination, lux	8-15	22
O&M cost, RUR mn.	75.0	0
Total Lamps installed capacity,	31	7
Operational time, h/year	4,380	4,380
Electricity consumption, kWh/year	135,780	30,660
Electricity cost, RUR mn.	475.2	107.3
Energy Savings, RUR mn.	367.9	
Energy Savings, %	**77**	
Investment, RUR mn.	1,950	
Pay-back, years	**4.4**	

➢ **Buildings (public, commercial, industrial) Case Study:**

Energy efficiency modernization of University's, administration and dormitory buildings (RF Central Region)

To provide the heat for University buildings (both administration and dormitory accommodations for students) the obsolete boilers were replaced with modern, highly efficient ones with the total installed capacity 17,5 MW and also new, modern windows (total is about 2700 units) were installed instead of old ones. These measures will lead to electricity consumption savings up to 28% due to refusal of electricity heaters using during autumn-winter period. Gas saving will be up to 50%.

Capacity of the new HOW boilers, MW (thermal).	17.5	
Annual gas consumption, MWh fuel eq	29,610	14,908
Annual electricity consumption, MWh fuel eq.	21,892	15,838
Heat consumption from DHC, MWh	5,120	0
Energy saving, MWh fuel eq.	25,876	
O&M cost, RUR mn.	8.4	1.35
Energy saving, RUR mn.	16,355	
Energy saving ratio in comparison to base line	**28.8 %**	
Investment , RUR mn.	122.5	
IRR%	18.5	
Simple payback period, years	**5.2**	
Reduction of GHG emissions, tons equiv. CO2/y	3,927	

➢ **Industrial tune-ups Case Study:**
Replacing of pistons compressors with screw ones at the machinery (RF Siberian Region)

A company would like to replace pistons low efficiency compressors with new modern screw ones that will lead to electricity consumption saving up to 50%.

Items	Before replacement (base scenario)	After replacement
Installed capacity of compressors, kW	480	270
Usable capacity of compressors, kW	480	220
Operational time, h/year	4,820	4,820
Electricity consumption, kWh/year	2,313,600	1,060,400
Electricity cost, RUR mn.	6,478	3,509
Energy Savings, RUR mn.	3,509	
Energy Savings, %	**54**	
Investment, RUR mn.	9.3	
Pay-back, years	**2.7**	

Replacing old gas boilers with new condensation boilers

Exhaust gases of common gas boilers contain plenty of steam which consists of hydrogen from fuel and oxygen from the atmosphere. Energy of that steam can be used for low-temperature consumers (central heating). For the purposes of heating electric power is an inefficient choice. At transition to fuel heating the economy of power resources reaches up to 75% and an even higher percentage can be reached if renewable energy sources are used.

Upgrading the systems of steam distribution and delivery

A good project in all industries involves decentralisation of compressed air production, using new, high efficient air compressors. This type of investment usually pays back in 2 - 4 years. Old systems mainly have centralized steam production and long routes of transfer. Often in that case worked-out steam and hot condensate is not used. Decentralized systems and steam collectors and use of a condensate can improve the situation. The majority of old facilities still use manual management of valve gates, etc. Modern IT technologies can improve the management and control considerably.

Utilizing the technological process heat

As a general rule, some of the best energy efficiency projects for many industries are those related to recovery of waste heat, where it may be redirected into a technological process such as using flue gases to preheat the combustion air for burners. This approach also works where waste heat may be used for heating purposes through dedicated heat exchangers. Energy can be used at its different levels of temperatures for the use of heat for heating, drying and other aims.

Installation absorption coolers and modern cooling systems

Old systems are centralized and tend to incur large amount of energy losses. The distribution system uses less energy and loses a lesser amount of power.

Using variable speed electric engines

The work of the engine can be adjusted for corresponding loads resulting in economies on exceeding capacity of engines.

1.2 Renewable Energy Sources

Renewable energy sources capture energy from natural processes, replacing conventional energy that would otherwise have to be generated by fossil fuels, and hence, in many cases, substantially lowering Greenhouse Gas (GHG) emissions. Although purists note a distinction between energy efficiency and renewable energy, we have included renewable energy in this publication, as energy efficiency and renewable energy can go hand-in-hand.

Renewable energy investments are often capital-intensive, so it often makes sense to carry out energy efficiency investments first, hence lowering the capital cost of the renewable energy investments required to meet the lower energy demand.

➢ **Case Study:**

Construction of a biogas plant for recycling pig manure on the basis of a CHP (RF South Region)

The project targets the usage of renewable energy sources. The aim is to construct and operate a biogas plant using the animal manure from the pig farm complex and the biomass waste from the meat processing plant. The produced electricity will be utilized at the facilities of the plant and the bio-fertilizer will be sold.

Items	Before project	After project
Number of animals	12,000 sows 240,000 pigs	
Produced biogas, m³/day	0	25,056
Annual biogas production [m³]	0	9,120,384
Annual production of bio-fertilizer, tonns	0	31,668
Capacity of CHP , MW		3 (el), 3.6 (thermal).
Annual available produced heat MWh	0	12,474.8
Annual usable electricity generated by biogas unit, MWh		17,474.5
Annual electricity consumption, MWh	21,311.8	21,311.8
Annual electricity purchase, MWh	21,311.8	3,837.3
Energy saving, MWh	17,474.5	
Energy saving ratio in comparison to base line	**82 %**	
Investment , RUR mn.	370.6	
Annual average energy cost saving, RUR mn.	0	69.9
Annual income from fertilizer sales, RUR mn.	0	51.4
Annual average maintenance costs, RUR mn.	0	4.8
IRR%	26.6	
Simple payback period, years	**3.2**	
Reduction of GHG emissions, tons equiv. CO2/y	118,872	

Combined Heat and Power / Co-generation

Whenever there is a simultaneous requirement for heat and electricity (in certain ratios), simultaneous production, within the same equipment, of both forms of energy is always more efficient than separate production. For example, the most efficient steam cycle converts maximum 50% (for the best power plants) of the input energy, the rest being rejected to the cold source. Cogeneration, by capturing excess heat, allows a better use of input energy than conventional power plants, potentially achieving 75% - 85% overall efficiency, making it one of the most effective energy efficiency technologies.

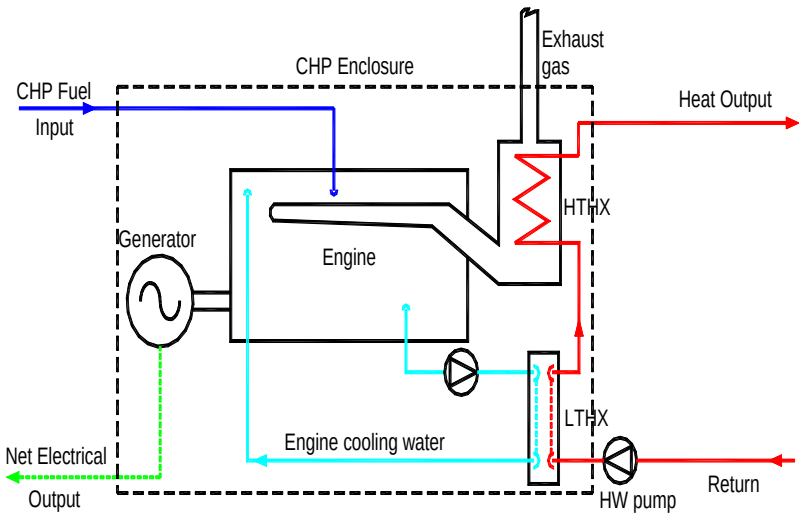
Many enterprises use boilers for production of steam / hot water. The electricity is taken from the power grid.

Replacing these boilers by high pressure boilers will make the production of electric power in steam turbines possible as low pressure steam at an output of the turbine can be used for technological needs.

- **Case Study:**

Implementation of a cogeneration unit for own purposes.

A company would like to install a combined heat and power plant (CHP). The process at the site uses a significant amount of electricity and there is a high demand for heat that is currently provided for by boilers to produce both steam and hot water. The process and boilers use natural gas which the company has available on site, but they believe that a gas power combustion engine driven generator will provide not only the low grade hot water required by their process, but also that the high grade heat available will provide steam to their consumers.



Packaged Gas Engine CHP with single grade hot water heat output and no heat dump

	Before project	After project
Capacity of CHP , MW		1,0 (el), 1,2 (thermal).
Annual gas consumption, MWh fuel eq	12,404	20,517
Annual electricity consumption, MWh fuel eq.	19,839	19,839
Annual electricity purchase, MWh	5,669	0
Energy saving, MWh fuel eq.	11,725	
Energy saving, RUR mn.	12.5	
Energy saving ratio in comparison to base line	**36.4 %**	
Investment , RUR mn.	82.5	
IRR%	12.2	
Simple payback period, years	**5.5**	
Reduction of GHG emissions, tons equiv. CO2/y	8,281	

2. DEFINING YOUR ENERGY EFFICIENCY PROJECT

To prepare a company's energy plan which forms the basis for minimising purchase costs and energy use it is necessary to develop a pipeline of energy savings projects.

The technical assessment of these projects will help a company to develop an investment programme and to define a strategy of energy plan implementation to reach the relatively high returns and relatively low technical risks.

Such an energy plan can help to reduce energy consumption and may also have other positive implications, such as improved product quality. Benefits can also be gained through environmental improvements and from the demonstration effect on the business community. More than ever, companies are facing increased competitive pressures to produce high quality products at comparable or lower cost. With rising energy prices, companies are pressured to bring energy costs in line with standards of best practice.

One of the effective tools to define an energy efficiency project is an energy audit (EA) that should be used by all energy consumers as it provides a snapshot of the current state of energy efficiency and outlines where energy losses occur.

2.1 Energy Audits (EA):

- Indicate the processes and places where major losses of energy occur;
- Determine the current technical status of equipment and processes;
- Outline a coherent set of measures to lower energy consumption and, implicitly, help financial decision-makers to prioritize potential investments that may be competing for scarce funds;
- Highlight the best way to schedule investments, taking into account technical, economic and financing considerations;
- Substantiate the investment proposals to the company or community's financial decision-makers, and their financiers.

Tasks of Energy Audits (EA) are:

- Define energy balance;
- Analysis of production costs;
- Technical feasibility analysis of the proposed projects for improving the energy efficiency;
- Identification of additional feasible opportunities;
- Assessment of compliance with applicable environmental, health & safety and social laws, regulations and standards.

The implementation of regular EA is an important part of a company's energy management system. The results from an EA can be used by site operators to identify recommendations for energy efficiency improvements at a site. This can include the setting of realistic energy efficiency targets for the site. Once the system

of energy management is in place any slippage can be easily identified and acted upon.

The identification and implementation of recommendations for energy efficiency improvements arising from an EA can deliver different inter-related benefits to site operators:

- Setting of energy efficiency targets;
- Financial benefits in terms of reduced costs or increased profits;
- Operational benefits including improved productivity, comfort and safety, and security of energy supply;
- Environmental benefits such as sustainability, conservation of resources and emissions savings including greenhouse gas reductions.

2.1.1 Energy Audit: Stage 1

This phase includes:

- Introductory contact
- Visiting the factory and inspecting the main processes & plants
- Agreement on further activities.

The contact to the company is established, and the basis for the future cooperation is formed. It is important to know the attitude of the company concerning energy savings. What has the company implemented previously, and what are their plans for the future? On the other hand, the energy auditor can inform the company on the contents of the energy audit, and what can be the expected results. Historical data for the energy consumption are collected (a questionnaire can be posted to the factory in advance). During one or more visits to the factory data and the general impressions are collected for the main processes and plants.

2.1.2 Energy Audit: Stage 2

This stage includes:

- Make a site visit (2 - 5 days)
- Meeting with the management
- Meeting with engineers concerning production (questions to ask the technical director)
- Plant visit and assessment of energy situation
- Mapping the energy consumption
- Locating possible significant savings
- Agreement on further activities.

Consumption and Costs

It is necessary to obtain an accurate picture of the current consumption, how much is spent on energy in different forms and the unit costs, as well as what it is used for, which uses are essential and which are not. This information should be obtained from the following:

- Utility invoices for fuel, electricity and water for at least one year;
- Site energy records/sub-metering;
- Production information.

Energy Mapping

The next stage of an energy audit is to obtain information on energy use by the various types of activity in the organisation, which can then be audited separately to establish consumption and costs. Effort can then be directed to the major areas and opportunities for savings can be examined in more detail.

The first step is to establish a list of the main services and/or end users. Try to identify specific areas of consumption such as:

- Factory services (motive power; compressed air; refrigeration etc);
- Heating processes (boilers; furnaces; kilns etc);
- Building services (space heating; domestic hot water; lighting etc). Initially consumption and, therefore, costs can be estimated on the basis of installed load, operating hours and utilisation factor. Consumption information can be presented in the form of a Sankey diagram.

What is expected from the Auditors?

- ✓ **Expertise in all energy-related areas, such as energy production, energy distribution as well as energy consumption.**
- ✓ **Full understanding of the process.**
- ✓ **Flexibility and efficiency during the site visit.**
- ✓ **Identification of saving opportunities.**
- ✓ **Correct calculations and good estimations.**
- ✓ **Clear report**

What is expected from the enterprise, engineers on site, management of the company?

- ✓ **Trusting and open collaboration between the Auditor and the respective company.**
- ✓ **Reliability of data, which the company delivers to the Auditor for analysis.**
- ✓ **Designation of a specific person from the company, who is available and qualified to answer questions before visiting the site.**
- ✓ **Readiness to discuss problems and share ideas concerning possible energy efficiency measures.**
- ✓ **Assistance during the site visit, e.g. transportation to the plant.**

2.1.3 Energy Audit: Stage 3

Analysis & Evaluation of Energy Performance

Auditors should assess the energy performance in the context of site activity and develop appropriate energy performance indicators for the entire site and/or individual energy systems. These indicators provide a means for quantifying energy costs and consumption against important parameters, including production.

In this phase the energy auditor calculates key data – i.e. specific energy consumption (kWh per production unit) - for the factory as a whole and for the energy heavy plants and systems.

Examples of key data are:

- Glass factory: kWh per ton produced glass; Water consumption: m^3 per ton produced glass
- Brewery: kWh per litre of beer
- Carpet industry: kWh per m^2 produced carpet
- Compressed air plant: kWh per delivered m^3 of air.
- Auditors should endeavour to benchmark energy performance against other sites in

the operator's organisation, in the same industry sector or in a comparable sector.

Audit Recommendations

The Auditor should identify a set of recommendations for improving the energy performance of the site. Recommendations could include:

- Modification or replacement of existing plant and/or equipment;
- Modification of operational procedures;
- Review of maintenance and other activities that affect the efficient use of energy;
- Additional investigations of potential energy saving measures for specific plant or processes.

Evaluation of Recommendations

The Auditor should determine the savings and costs associated with each recommendation identified during the Audit. The savings should be expressed for each recommendation in terms of:

- Actual energy saved in kWh or GJ by determining a change in a specific parameter; for example temperature, running time or installed power.
- Annual greenhouse gas emissions savings in terms of tonnes of CO_2
- Cost of energy saved by using the site's invoice data for different energy streams.

For each recommendation, the costs should be expressed in terms of:

- The capital expenditure required for implementation.
- The simple payback period,
- Capital cost per tonne of annual CO_2 emissions savings.

It may be useful to divide the recommendations into three cost categories, for example: no/low cost; medium cost; high cost.

Overlapping recommendations

The Auditor should identify, and where possible quantify, any interdependency between the recommendations identified as part of the audit. Overlap may exist in the predicted levels of energy savings associated with different recommendations whereby the combined savings from implementing two recommendations may be less than the sum of the savings from each measure implemented independently. An example would be the annual savings associated with improving the insulation on a boiler shell and with reducing the running hours of the boiler.

The 3rd stage will also include:

- Evaluating the energy savings and economic results from the implementation of different possible measures
- Selection of energy saving projects
- Establish technical & economic key data
- Submitting the energy audit report

- Decision whether to implement or not
- Agreement on further activities.

At the end of stage 3, the final Energy Audit Report is submitted to the enterprise management. It is important that the essential parts of the report are discussed with the corresponding enterprise officials.

2.1.4 Energy Audit Stage 4:

Implementation of Recommendations

This stage includes the planning and the execution of the finally selected energy saving projects. The energy auditor cannot participate in these activities, since he often is (or perhaps should be) an independent person (independent from the suppliers and manufacturers of different equipment). But he can make an agreement with the enterprise concerning the supervision of the implementation process. Another typical activity could be to initiate or improve the future energy management. Based on the energy mapping, important processes and plants can be equipped with meters and a plan for the data analysis, etc. can be formulated by the auditor. If possible, the auditor should keep in contact with the factory in order to receive information - or perhaps perform control measurements - after the implementation of the saving projects.

2.2 Energy Audit Checklists

The following is a checklist of items that should be investigated in the course of an energy audit. Not all of the items included are relevant to all sites. Furthermore, the checklist is not exhaustive and auditors on some sites may identify additional areas for assessment.

Energy Inputs		Buildings	
Checks	• Check usage, cost, storage facilities for oil, gas, solid fuel. • Check potential for alternative supply contracts. • Check potential for use of alternative fuels. • Check electricity usage, cost, supply and load patterns. • Check potential for alternative supplier or tariff structure. • Check potential for power factor correction.	**Checks**	• Check location, orientation, exposure, size, shape, age of individual buildings. • Check floor areas and floor layouts. • Check building uses, occupancy patterns, occupancy rates. • Check building fabric with respect to insulation standards, glazing standards, air infiltration.

Energy Conversion Plant (Fired)		Distribution Systems	
Checks	• Check make, type, rating, age of individual boilers and burners. • Check physical condition, servicing records. • Check fuel consumption data for individual plants. • Check usage patterns, demand, control. • Check combustion efficiencies over firing range. • Check seasonal efficiencies. • Check insulation standard, condition and suitability. • Check potential for load reduction. • Check potential for boiler replacement and improvement of control system.	**Checks**	• Check leaks and losses in hot water distribution systems. • Check leaks and losses in chilled water distribution systems. • Check leaks and losses in steam distribution systems. • Check leaks and losses in thermal fluid distribution systems. • Check imbalances between supply and end use e.g. from meters. • Check insulation standard, condition and suitability. • Check potential for reducing flow rates in and rationalization of piping and ducting systems. • Check steam trap operation. • Check condensate return and potential for additional recovery. • Check flash steam and potential for additional recovery. • Check loadings and efficiencies of transformers. • Check potential for rationalization of electrical distribution system.

Space Heating		Refrigeration Plant	
Checks	• Check type of heating system installed. • Check running hours and heating regime in relation to occupancy. • Check actual versus temperature design comfort conditions. • Check heating load. • Check position, operation and condition of system equipment and existing controls. • Check need for additional controls. • Check leaks and losses in conditioned air distribution systems.	**Checks**	• Check make, type, rating, age of equipment. • Check physical conditions, servicing records. • Check energy input versus refrigeration output. • Check usage patterns, demand and control. • Check insulation standard, condition and suitability. • Check potential for reducing refrigeration demand. • Check potential for heat recovery.

Air Conditioning & Ventilation		Process Heating & Cooling	
Checks	• Check type of system(s) installed. • Check air conditioning / ventilation regime in relation to occupancy. • Check actual versus design comfort conditions. • Check heating / cooling and ventilation loads. • Check position, operation and condition of system equipment and existing controls. • Check need for additional controls. • Check leaks and losses in conditioned air distribution systems.	**Checks**	• Check type of system(s) installed. • Check actual versus design conditions. • Check heating and cooling loads. • Check condition and operation of system equipment and controls. • Check need for additional controls. • Check other methods of saving.

2.3 Energy Audit Report

After finishing of the EA the Auditor/Consultant should ensure that:

- The Audit findings are brought to the attention of, and considered by, appropriate site management;
- A final list of recommendations is selected for implementation;
- The final list of recommendations is included in an implementation programme in which each recommendation is allocated a specific target date, sufficient resources and a specific individual responsible for its completion;
- The final recommendations are incorporated as targets into the site's Environmental Management Programme;
- The performance of the implemented recommendations are monitored, recorded and incorporated as inputs into the next Energy Audit.

The layout and style of the Main Report is at the discretion of the auditor. However, it should be presented in a clear, concise and logical format. Large tables, data sets, plots, diagrams, equipment documentation, policy statements and any sampling, testing or calibration reports should be included in appendices only. The report should include inter alia:

- Overview of the activities at the site and the main energy consumers;
- Details of the timing of the Audit with respect to weather and site production / occupancy levels;
- Details of the period covered by the Audit;
- Details of the scope of the Audit including the areas, systems and activities assessed;
- The status of the energy management system at the site;
- The current energy performance of the site and of each of the energy systems assessed in the Audit;

- The Audit recommendations quantified in terms of energy and emissions savings and payback period.

A Company should have developed an implementation plan for the projects, and the auditor should discuss the plan with the site representative. The plan should be summarized in the audit report and the auditor should make any comments or suggestions on this with particular reference to energy savings and environmental issues. Comments should also be provided on the plan with respect to timing, and any hold ups in project commissioning that can be identified.

Particular areas that should be considered are:

- Does the plan include any clearance of the old process or plan, and how will this impact on product output and company profitability?
- Are the utility services for the new project adequately covered and designed into the plan, for example is there adequate water supply, electricity capacity etc?
- Have any legislative permits required been considered, and has gaining permissions been built into the plan. Is the time required to gain the permissions adequate?
- If no implementation plan is available at the time of the audit, the auditor should ask for a plan to be assembled and sent to them soon after the audit is completed.

3. FINANCING YOUR ENERGY EFFICIENCY PROJECT

3.1.1 Identifying energy efficiency projects

Each successful investment must:

- Be technically robust;
- Have good internal economics;
- Be submitted by a solvent or creditworthy project developer;
- Compete for scarce funds against other investment priorities;
- Be supported by decision-makers before a study takes place;
- Continue to be supported after a study takes place.

An additional key success factor is an empowered financial decision-maker.

It is usually easy to identify technically robust energy efficiency solutions with good internal economics. It is usually relatively easy to find an appropriate financing solution. As the banking market was developing rapidly and non-conventional financing solutions such as supplier credit, build-own-operate-transfer and leasing were becoming more commonplace. It is often difficult to persuade CEOs or Managing Directors to prioritise energy efficiency investment opportunities over other investment opportunities.

Often the engineers working for potential investors propose over-sized or otherwise inappropriate technical solutions, sometimes being led by external salespeople. It is important that the project is evaluated by the enterprise's economic decision-makers, rather than by technical staff, to contrast the economics of, for example, replacing burners and adding automation and control against replacing the entire boiler (where applicable). Frequently the economics of simple, low-cost solutions are vastly superior to the more complex, high-cost ones. Therefore it is important to involve a commercial financier from day one.

Key factors for successful project financing

- ☑ **Keep the presentation to lender simple and have all required documentation ready, including support documents that verify the financial analysis**
- ☑ **Make the timeline achievable**
- ☑ **Choose responsible project partners**
- ☑ **Ensure that the monitoring and verification (M&V) protocol is clearly defined**
- ☑ **Do not agree to contract terms that are not enforceable**
- ☑ **Ensure that supply contracts are in place with fixed prices**
- ☑ **Ensure that all agreements and legal documents are in place**
- ☑ **Always be aware of what the risks are and allocate them when feasible to the appropriate parties. Lowering these risks will make the project more viable for FIs' financing.**
- ☑ **Consider probability of default by the parties and its impact on the financial statement**
- ☑ **Ensure that an operation and maintenance plan is in place along with a plan to ensure that facility personnel are properly trained to implement it**
- ☑ **Utilize known technologies in early projects**
- ☑ **Plan for cost over-runs by establishing a contingency fund**
- ☑ **Include performance and investment guarantee provision in the contract.**

It is a very good idea for the company to involve a bank, or other type of commercial financier, to sign an Agreement-in-Principle that funds would be available for an investment, before offering financing. Usually if a would-be investor is hesitant to call the bank, this is a good indicator that s/he would later on be hesitant about making a firm investment decision.

3.2 Barriers for choosing energy efficiency projects

The primary objective of a manufacturing enterprise is to make profits for its shareholders. It does so by buying in raw materials and converting them into products which it sells to its customers. To ensure its long-term survival, a company must also re-invest at least part of the proceeds; to allow for expansion, to become more competitive and to provide for the development of new products that will be its source of income in future years. Energy is an essential commodity for every manufacturing enterprise and one of the few cost elements present in the manufacture of every industrial product. Energy is also one of the five largest measurable and controllable cost elements in at least 80% of all industrial production. The technology already exists to reduce energy consumption by 25%, and the capital equipment is commercially available. If industry and the other energy consuming sectors of the economy were to invest only in energy saving capital projects, which offer a better financial return than most other forms of investment, this would be more than enough to meet current targets for reducing the emissions of greenhouse gases such as CO_2.

It would be natural to assume that if an organisation has a worthwhile investment project with a good return it would find the capital resources and give the project the appropriate priority. In practice, industry is very hesitant about investing in energy efficiency. It is only recently that the reasons for this have become clearly understood. There are three main barriers to overcome:

- The low priority given to energy efficiency in most organisations.
- Ensuring that the standards of investment appraisal used are appropriate to the company's needs.
- Ensuring the decision to invest or not is taken at the right level in the company.

Most companies are currently unable to handle the financial appraisals of large numbers of projects simultaneously, and so they set simple rules to filter out unlikely projects, such as payback criterion. How companies do this varies. They sometimes, for example, set different payback criteria for investments in different parts of the business, however much this disregards what they know of the theory of financial appraisal. Companies also tend to limit individual projects to one submission to the board of directors. This may be appropriate for investments that are clearly influenced by changing market factors, but it is not usually the case for energy efficiency measures. Energy managers should be careful not to allow good projects to wither away like this.

Reducing energy costs is an investment area for which financial appraisal is ideally suited. Energy managers who make time to understand the purpose and principles of financial appraisal may appreciate the strengths and weaknesses of their

organization's financial management more. They can then use this knowledge to ensure that energy efficiency obtains the appropriate investment priority within the organization. The inadequacies of energy efficiency investment cannot be blamed solely to organizational defects. Energy efficiency often fares badly for the simple reason that the financial appraisal is done badly. The responsibility for this must rest with energy managers.

There are four principal ways in which the financial appraisal of energy efficiency projects can go wrong:

- The project's benefits are underestimated, with the result that the project looks less attractive than it really is and is not proceeded with.
- The engineering options are not fully explored, so the costs and benefits are not optimised.
- The costs are underestimated so that the project appears more attractive than it really is. When it goes ahead the actual costs come to light and create a prejudice against similar projects in the future.
- The decision is taken at the wrong level; for example, senior management sets financial criteria in terms of payback which are taken too literally and are not related to the funds which are available, or to the potential return on investment.

The last point, which is supposed to be a simple filter to assist senior management, usually fails because junior managers misinterpret its meaning. It ought to mean that projects with a longer payback are not likely to be funded, not that they should not be considered at all. Investment is like an iceberg: if management only sees what lies above the water, it will not realise the value of appropriate investment. Projects which fall outside payback criteria should still go forward to senior management for decision. Many senior company executives have never realised the potential for energy savings, because they have never seen a submission which sets it out.

3.3 Financial Appraisal of Your Project

In the following paragraph the financial appraisal is described in detail. It is very important, that the responsible person of your company (e.g. company´s manager, accountant, chief engineer) understands the proceeds of the financial appraisal in the financing bank. Furthermore it describes the required documentation for financing an investment.

3.3.1 Key stages in Economic Evaluation

From a bank's point of view the most important part of an energy efficiency project appraisal is the financial appraisal. At this point we would like to give a brief outline to our approach on financial appraisal of energy efficiency & renewable energy projects. For existing enterprises the credit assessment comprises not only the appraisal of the project but also the past performance (if the enterprise is already a client of the bank) and the overall creditworthiness of the potential borrower, taking into consideration market and competition, management and business concept, the previous and present profitability, the stability of future cash-flows, and - last but not least – the availability of collateral.

The driving force for industrial energy efficiency investments is cost cutting; commercial banks base loan decisions on the creditworthiness of the entire company. Assumed that the core business of the company is sound, a basic condition to convince a bank to finance an energy efficiency & renewable energy investment is a well-prepared rational energy utilisation plan (REUP) based on reliable data and detailed financial analysis. Economic evaluation is a rational method for making choices. Any good commercial organization ought to be able to identify more viable investment opportunities than it has money to invest in; therefore it has to choose which projects to fund. The economic evaluation enables these choices to be made, by using calculations on financial return an indication of each project's value to the organization.

The objectives of economic evaluation are:

- To decide which investments will make the best use of the organisation's money;
- To ensure that the optimum benefits are available from each of these investments;
- To minimise any risk to the organisation;
- To provide a basis for the later analysis of the performance of each investment;
- To produce measures of the financial improvement that each project could make to the business;
- To identify the risks and uncertainties in each project;
- To define the expected costs and benefits.

The decision maker can then use the results of the evaluation to choose between projects. Economic evaluation helps organisations make the right choices. However, as projects to improve energy efficiency are likely to be competing for funds against other projects, what is really being evaluated is the project's position within a list of possibilities. To give energy projects the best chance of being funded, an economic evaluation should be presented with the proposal; the decision maker will then be able to compare the benefits of the energy project directly with the other investment proposals.

Economic evaluation produces financial measures of the potential of each of the possible investments open to the organisation. These measures can then be used to decide which projects should be funded and the priority they should be given. Economic evaluation should not be considered as a technique for creating absolute values. It compares the merits of investing in various projects, rather than deciding in isolation whether any one idea is worth supporting. Economic evaluation tries to show the benefits of projects in relation to their capital costs; however it is often difficult to find any single parameter, which measures this. There are many different measures that can be used for economic evaluation, each of which highlights a different aspect of a project.

No one measure is better than any other, and each has its strengths and weaknesses:

- Simple methods;
- Discounting method.

Simple investment methods

This approach is used for preliminary financial assessment of energy efficient projects. Assessment of investment efficiency is based on non-discounted cash flows. Rise in prices isn't considered in cash flow. The parameters of the project's effectiveness are estimated without financing (from the point of view of all the project investors). The results show if it is reasonable to proceed with technical and economical calculations for the project.

The most frequently used simple methods are:

- Calculation of rate of return;
- Calculation of payback period.

The disadvantage of this approach is inaccuracy of the calculations. The activity after the payback period is not taken into consideration. Simple investment methods cannot be used for comparing variants with different project durations.

Discounting method

The essence of this method is in preliminary discounting of the estimated cash flow based on the feasible discount rate. Most commonly the real discount rate (cleared from inflation rate) is used when the energy projects are evaluated. Inflation expectations are not taken into consideration when the project cash flow is structured. When the rate of energy cost increase is defined the total inflation index is not taken into consideration.

The following discounting methods are distinguished:

- Net Present Value (NPV) method;
- Internal Rate of Return (IRR) method;
- Payback method.

Each of it has its own advantages and disadvantages.

Net Present Value (NPV) considers value of money but not the risks. Besides the fact that money is the absolute measure does not allow us to compare the projects with different level of financing.

IRR illuminates the above mentioned disadvantages though does not take into account the cost of capital and unfortunately does not have any economical definition (for example as NVP).This indicator is a bit more complicated.

Finally **payback** period does not take into consideration the time value of funds. Project payback period without absolute and relative project income does not provide effectiveness of the investments to the full.

For the system analyses of the investments it is necessary to use all three indicators which complement each other, that is why most of the companies use these three methods combined.

The choice of method

The relative merits of using NPV, IRR, Payback method to evaluate a project are often discussed, because the results of the evaluation will sometimes vary depending on the method used. The following rules of thumb give an idea when the different methods should be used.

- Payback must be preferred when the life duration of the project is known.
- Net Present Value must be preferred to compare projects demanding similar investments and with similar useful lives, which are compared with each other and then the discount rate is known.
- Internal Rate of Return must be preferred when the discount rate is unknown or questionable; on projects with different levels of investment and useful lives are compared with each other. The NPV must be determined complementarily.

Project calculation
For an example of a project cash flow analysis see **Annex 1**.

3.3.2 Uncertainties and Sensitivities

Risk analysis

For successful identification of savings, the most reliable sources of information must be used and the accuracy of each piece of data must be estimated. As a result, it should be possible to place confidence limits on the reliability of each piece of information which can be used in later calculations. For example, equipment supplier's claims may be optimistic or even theoretical, so information from actual users of the equipment may be more reliable. Allowance must be made for the actual operating conditions at another user's premises: if these are not the same as those on the proposer's site, the figures may not be comparable.

Confidence limits allow the risk in using any particular value for a cost or a saving involved in the project to be evaluated and included in the proposal. Having assessed the risk, it is possible to determine the 'Optimistic' and 'Pessimistic' conditions for the value used, in addition to the normal, or ‘realistic’, case.

Sensitivity Analysis

During the evaluation of a project, values will have to be assumed for some of the project's unknown aspects. These include factors outside management control, such as the cost of fuel or materials, and factors partially within management control, including current production costs, timing and production rate. Sensitivity analysis involves testing the assumptions used in deriving the cash flow to determine the impact of an assumption that proves to be erroneous. For each area of assumption, there will be a range of plausible values for the parameter concerned. The financial evaluation of the project is not complete until financial parameters have also been calculated using the limits of these assumptions.

3.4 Methods to Finance Your Energy Efficiency Project

3.4.1 Corporate Lending

A bank will usually lend 60 - 90% of the value of a property that is used as security. In case the liquidation value of the company is lower than the expected loan the bank may also request personal/additional guarantees, through the provision of external capital. Other security possibilities, including company bank accounts, shareholdings, endowments, debentures, and book debts depend on individual arrangements with the bank. Banks consider longer term debt to have a higher risk, and will determine loan repayment terms based upon the capacity to repay. Therefore, in the case of corporate lending banks prefer shorter debt maturities.

Corporate strategy and the 'canons of lending' (analysis of financial and non-financial information, value of security, product and pricing considerations, regular monitoring of management information, etc.) are the foundations of corporate lending. These principles apply to all of the core corporate bank customers including companies, who form the bulk of customer base, as well as partnerships, non-profit making bodies, and other non-standard customers.

3.4.2 SME Lending

Small and medium-sized enterprises lending in Russia is mainly focused on working capital financing and is less focused on capital investment and development of the business itself.

SMEs are covering about 50% of the energy efficiency potential in Russia. Nevertheless choosing between energy efficient project and the development of business (increasing of the operational indicators, sale and service proceeds) the priority is often put on the last.

SME lending has a number of barriers:

- No transparency of Russian SMEs (data discrepancy of the official bookkeeping and management accounting);
- Absence of trustworthy collaterals as the majority of the representative of SMEs do not own liquidation assets;
- Distrust of the credit institutions in SMEs (absence of good reputation and favorable credit history);
- Exclusive credit terms due to high risks.

3.4.3 Leasing

Financing EE projects through leasing is an additional instrument to attract funds for the enterprises. Unlike the investment loan, leasing has its advantages and disadvantages.

The advantages are:

- The working capital of the company remains available. The equipment is kept at the balance of the leasing company. Thus a company can transfer available cash assets for the development of its assets and at the same time it can use the energy saving equipment or get additional income from the energy generated by RE which allows to cover the payments under leasing agreement.
- Tax optimization:
    - According to Russian legislation any leasing payment is referred to the production costs of the lessee thus reducing the tax base which is not specified by the bank loan;
    - When equipment is acquired under a leasing agreement, VAT is to be paid by the leasing company, not by the lessee what reduces the VAT payments. VAT paid by the lessee under leasing agreements is to be compensated or cross charged full-scale;
    - Property tax is to be paid by the leasing company;
    - The possibility to use the fast depreciation rate no more than 3 %, this provides the possibility to the lessee to obtain the equipment into ownership at the book value which reduces the property tax in future.
- The flexibility in the leasing transaction processing. Normally approving a leasing application is faster than approving a loan. The financial standing of the company is evaluated using the simplified scheme. The leasing companies can check the management activity of the potential lessee (the enterprise) and evaluate its solid assets.
- There is no necessity to have collaterals (encumbrance, security for loan, guarantee).
- Leasing has a number of disadvantages:
    - EE equipment, owned by the leasing company will bear responsibility for the operation and after service which may cause additional technical risks.
    - Leasing could be more expensive than a loan.

3.4.4 Principles of Project Assessment

Partner Banks principles of project assessment are similar in both types of finance.
The financial appraisal of energy efficiency projects comprises the

- Estimated investment;
- Financing sources;
- Profitability and cash flow projections;
- Viability parameters, and
- Sensitivity analysis.

However, banks will not base their lending decision on expected future cash flows only, but will also require own resources of the company and collateral to share and cover the lending risk. Typically the company will provide the new equipment as collateral. Depending on the internal lending policy of the bank, additional collateral might be required.

3.5 Preparing a Business Proposal

3.5.1 Structure of an Energy Efficiency Project Proposal

The project proposal should always be prepared in accordance with the standard procedures of the Partner Bank considering the investment. As far as possible, a format should be adopted which clearly sets out:

- Why the project is being considered
- What the project is intended to achieve
- What the financial and other benefits will be.

These points outline the detail of the proposal, which must be presented in a form that the decision maker requires and can understand. The proposal must aim to help the decision making process. If your organisation does not use a standard format, then the following elements would normally be addressed in a logical order:

- **Summary**: Setting out the key elements of the proposal, explaining briefly why the project meets the organisation's needs and the likely benefits.
- **Description**: Explaining in detail the present status and how the project will improve the situation in all respects; any relevant disadvantages should also be mentioned.
- **Alternatives**: Showing that where alternatives exist they have been considered and are inferior to the project proposed.
- **Finance**: Setting out the financial justification for the project, indicating the appropriate measures of value, the payback period, IRR, etc.
- **Sensitivity and Risk**: Examining any assumptions that have been made and determining their likely effect in relation to the main financial case that is being proposed.

3.5.2 Preparing the Investment Proposal: What to Be Aware of

The financial director or the person responsible for financial issues must be aware that the enterprise might have received inappropriate advice in the past, and that they might have been considering hiring consultants to perform studies to support energy efficiency investments that were somehow inappropriate.

Examples include:

- Proposals to replace public lighting systems on a 'like-for-like' basis, without taking into account that technical norms for public lighting had changed in the years since the existing system was installed;
- Proposals to invest in community heating systems, when the outlook for the survival of the system was poor, and the managers of the system (who had often proposed the investment) had not addressed basic management and economic issues such as improving collection of payments from their customers, or addressing the issue of customer disconnection;
- Proposals to design a combined heat and power production (CHP) system, when there was a clear technical barrier (such as insufficient natural gas pressure in that part of the network), or an obvious economic barrier (such as the lack of a stable base-load hot water demand);

- Proposals to carry out complex, expensive energy efficiency improvements, when a quick 'back-of-the-envelope' estimate of the likely cost of the investment and the financials/creditworthiness of the investor suggested that the investment would be unaffordable, and that a commercial financier would be unlikely to lend for such a project.

The advice to would-be-investors is to seek expert opinion from a wide range of experts, meaning:

- Do not rely only upon the advice of internal engineers;
- Do not rely only upon the advice of equipment suppliers, who may wish to sell over-sized or inappropriate equipment;
- Do not rely only upon the advice of consultants, particularly to whom you may intend to award a contract to perform a study;
- Do not rely only upon the advice of consultants who may be 'tied' to equipment suppliers;
- Always ask 'will there still be a demand for the energy service that I would like to improve after an investment takes place;
- Take into account the amount of money you can afford to invest, or to borrow, to avoid spending resources in the development of technical studies to support unaffordable investments;
- As with any other kind of investment, talk to a wide range of stakeholders and experts – owners, investors, accountants, lawyers, engineers - before launching the first study;
- If you are considering borrowing to carry out an investment, talk to the bank before launching the study. Find out if what you are proposing is something they would – in principle – be prepared to lend for. You may find that the bank has financed similar investments for other customers, and may have unexpected insights on the costs and financial performance of the energy efficiency investment that you have proposed.

3.6 Success Factors

There are several key success factors for energy efficiency programmes.

Potential & Strategy

- Realistic estimate of energy efficiency potential.
- A development strategy will help determine energy demands.
- A step-by-step programme: start with cost-efficient measures and gradually move to more capital-intensive measures.

Organization

- Have a comprehensive action plan for energy efficiency.
- Appoint employees to supervise the project, award bonuses for project completion, get management involved, get technical and financial services involved.
- Keep detailed records of energy expenses at a departmental level or for the production divisions that have the highest levels of energy consumption.

Financing

- Calculate the Return on Investment (ROI).
- Recognize the benefits of securing outside financing.
- Announce the situation on the financial market, including the availability of long term funds.

Guide to Presenting Proposals	
Components of Business Plan	**Content and Level of Detail Required**
Project Summary	This should conform to the forms supplied by the Bank, plus energy efficiency particularities.
Introduction to Business	Business purpose
Nature of Project	Describes specific project
Benefits	Benefits to local and national economy (micro and macro level)
The Sponsors	Project's main parties: major stakeholders in financial success of project. And other main parties: contractors, investors and advisors.
Project Costs and Timetable	Estimated cost of implementation and schedule of implementation
Products, Services and Market	Brief description
Regulation and Environmental Information	Key regulations and permissions required for the project and environmental issues associated with project
Role of the Bank	Concise description of requested role of the Bank in project
Financing Plan	Preliminary ideas about the structure of the financing: who will provide how much funds
Cash flow Projections	Major key points from the financial analysis
Appendices: • Income Statement • Balance Sheet • Cash flow • Financial Ratios	Detailed forecasted calculations and technical descriptions to support proposal

3.7 Risk Analysis

A project usually involves some risk, as the outcome cannot be predicted with certainty. It is therefore necessary to have a measure of the risk involved in a project, by assessing the risk on each individual cost or saving and then finding the total result. Each value generated for the economic evaluation, optimistic and pessimistic situations, which could arise in a project, will have a degree of judgement associated with it. It is important to understand any factors which may cause the actual costs or savings to be different from your estimates.

Energy efficiency & renewable energy projects generally require long term investment and large capital assets. For planning the implementation of such

projects and to prepare bankable investments, it is necessary to determine and minimise project risks. The preparation of energy efficiency & renewable energy projects require an in-depth analysis. Generally, the risks related to these projects can be classified into three risk categories influencing economy of the planned investment directly or indirectly:

- **Technical** (e.g. construction risk, availability of raw material and its quality, technology risk, operation risk, risk to achieve guaranteed parameters, risk of changes of initial parameters)
- **Commercial** (e.g. price risk, risk of correct estimation of appropriate investment and operational costs, estimation of price, long payback period and interest rate changes, risk of exchange rate, loan risk, market risk)
- **Others** (e.g. natural disasters, political risk, social acceptance).

Energy efficiency projects can be divided into two main categories: Energy efficiency in industry and Renewable energy resources.

Specific risks coupled with energy efficiency projects are:

3.7.1 Technical Risks

Decrease of facility efficiency with time and its technical parameters (i.e. decrease of boiler's efficiency, degradation of insulation), energy efficiency of device, equipment or whole company should be in detail defined during the development phase of the energy efficiency project. The timely decrease of technical and energy efficiency is standard and has to be taken into account in project design.

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.

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.

Operation risk

Operation by partial loading, modification of operation hours of different types 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.

Changes of initial parameters

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).

3.7.2 Commercial Risks

Ability and willingness to pay and 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.

Price risks

Price risk is coupled with the development of prices involved in operation which can strongly influence profitability of investment project. These include: raw material purchase prices and products sale prices. 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.

Market risk and competitiveness

Financiers should 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.

3.7.3 Other Risks

Corporate risk (structure of shareholders) increases with number of shareholders; the decision making process is generally declining with a high number of shareholders.

Social risk

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

4. HOW YOUR BANK SEES YOUR PROJECT

After you have prepared and submitted the business proposal to finance your energy efficiency project you might like to know how your bank sees your project, and which criteria it uses to assess whether the project is worth financing.

4.1 Minimizing the Bank's Risk

While doing business is always risky, banks can take several steps to minimize the risks and difficulties. For example, within the industrial sector, there are a few basic characteristics to look for in an enterprise that will make structuring and financing deals easier:

- Hard currency earnings
- Proportionally large energy costs
- Market-oriented management team
- Financial viability.

4.2 What Will a Bank Need from Your Enterprise

Documentation package for loan application financing

A loan applicant must develop a project presentation package for potential financiers regardless of the loan application format. A standard package includes the documentation listed below.

Letter of Intent

Letter of Intent from the applicant to the financier.

Financial Information on the Applicant

- Applicant's audited financial statements for past three years (if available)
- Tax return for the last three years.
- Applicant's articles of incorporation and corporate resolution in case of a private company
- Financial Analysis Report that includes a cash flow analysis, internal rate of return, depreciation, payback period, tax summary sheet, and various ratios that indicate the financial health of the applicant: current assets/current liabilities; long-term debt ratio (total long-term debt/(total long-term debt + shareholders equity); debt to equity ratio (total liabilities/(total liabilities + shareholder debt)); debt coverage ratio (the ability to service debt, defined as annual cash flow before interest and taxes divided by the interest and principal payment; total debt ratio (annual cash flow before interest and taxes divided by average total liabilities);
- Information relating to creditworthiness such as assets for collateral and any credit guarantees.

Project Financials

Project pro forma, a report on the viability of the project that gives a revenue and expense projection showing anticipated costs and income over the duration of the project. Cost-benefit analysis for the project. Project Financing Structure Document or Resource Mobilization Report (optional; a schematic version of project financing showing loan and payment flows).

Project Documents and Proposal

- A summary of the audit results
- Performance contract
- Project proposal describing the objective, scope and management team, and providing the following financial basics on the project: project cost, loan amount, payment mechanism, procurement guidelines, project execution, and loan allocation
- Social and economic analysis detailing the economic and social benefits of the project
- Any supporting documentation, such as a savings verification review report reviewed by an independent engineer, assignment agreements, acceptance notices, and references from suppliers and customers.

4.3 What Will Your Bank Analyse? - Creditworthiness Appraisal

From a financial institution's point of view, conducting a proper evaluation of the borrower is the most important part of the overall energy efficiency project appraisal. No matter how strong an investment project may be from a technical and financial point of view, lenders will always want to check the overall creditworthiness of the potential borrower. Therefore, profitability estimates and cash flow projections will be analysed not only for the specific energy efficiency project, but also for the company as a whole.

Appraisal of an energy efficiency investment project always requires a detailed analysis process that covers the following:

- Promoter Creditworthiness Appraisal (Credit Analysis);
- Technical Appraisal;
- Financial Appraisal;
- Environmental Appraisal; and
- Legal Appraisal.
- For the technical, environmental and legal appraisals, lenders would rely on expert opinions conveyed in the technical studies and due diligence files. Although sometimes banks have appropriate internal expertise, in most of the cases they would use external consultants to review the documents presented by the borrower and answer questions like:
- Are the projected energy savings realistic? Is the basis of calculation appropriate?
- Which technology will be used for the energy efficiency project? Is this a proven technology or an innovative and therefore more risky one?

- Are there any drawbacks, such as impact on production or production schedules during implementation of the investment project?
- Are pollution levels going to decrease/increase after the implementation of the project and, if so, is there a need for environmental clearance?
- Prior to loan disbursement legal due diligence is needed to ensure that all licenses, permits and clearances were obtained and that the loan agreement and security package are in accordance with the bank's standard lending procedures.

Credit analysis definition

Credit analysis is the process of evaluating an applicant's loan request or a corporation's debt issue in order to determine the likelihood that the borrower will live up to his/her obligations. In other words, credit analysts examine the financial history of an applicant in order to determine creditworthiness. A key element of credit analysis is the prediction of the likelihood a firm will face financial distress.

4.3.1 What Will the Lenders Want to Review?

Regardless of where you seek funding, a prospective lender will review your creditworthiness. A creditworthiness appraisal requires a detailed analysis of the borrowers' financial position and debt-servicing ability, a thorough understanding of their background and the purpose of the loan and an evaluation of the collateral pledged. The basic components of credit analysis, the **'Five C's'** are described below to help you understand what the lender will be looking for when appraising your loan application.

Capacity refers to your ability (from technical, financial and managerial point of view) to run the business and to return the loan. Capacity to repay is the most critical of the five factors. The prospective lender will want to know exactly how you intend to repay the loan. The lender will consider the cash flow from the business, the timing of the repayment, and the probability of successful repayment of the loan. Payment history on existing credit relationships is considered an indicator of future payment performance. Prospective lenders also will want to know about contingent sources of repayment.

Capital refers to the long term sustainability of your company and of its sources of finance. Capital also refers to your own money invested in the business and is an indication of how much you/your company have at risk should the business fail. Prospective lenders and investors will expect you to have contributed from your own assets and to have undertaken personal financial risk before asking them to commit any funding.

Collateral: The lenders will check the strength and safety of the proposed security package in case the anticipated means of repayment failed (cash flow lower than expected). Collateral or guarantees are additional forms of security that the lenders request. Giving a lender collateral means that you pledge an asset (mortgage on real-estate, pledge on equipment) to the lender with the agreement that it will be the repayment source in case you cannot repay the loan. A guarantee, on the other

hand, is when someone else signs a guarantee document promising to repay the loan if you cannot. Some lenders may require such a guarantee in addition to collateral as security for a loan.

Conditions primarily focus on the intended purpose of the loan (will the money be used for working capital, additional equipment, or inventory) and concomitantly on the market and how the company performs in the market. The lender will also consider the local economic climate and conditions both within your industry and in other industries that could affect your business.

Character: The lender will review the integrity of the business and its management and form a subjective opinion as to whether or not you are sufficiently trustworthy to repay the loan or generate a return on funds invested in your company. In the case of a large company, the shareholders' and managers' reputation and experience in business will be carefully reviewed. In case of a small business the quality of your references and the background and experience levels of your staff will be taken into consideration.

4.3.2 Key Questions

A complete and thoroughly documented loan request (including a business plan) will help the lender understand your business. Obviously, every bank has its own unique creditworthiness appraisal methodology. However, you will find below some key questions that will be addressed by the lender when analysing a potential borrower's financial status.

Business strategy analysis

How does this business work? Why is it valuable? What is its strategy for sustaining or enhancing that value? How well-qualified is the management to carry out that strategy effectively? Is the viability of the business highly dependent on the talents of the existing management team?

Accounting analysis

How well do the firm's financial statements reflect its underlying economic reality? Are there reasons to believe that the firm's performance is stronger or weaker than reported profitability would suggest? Are there sizable off-balance-sheet liabilities (e.g. operating leases) that would affect the potential borrower's ability to repay the loan?

Financial analysis

Is the firm's level of profitability unusually high or low? What are the sources of any unusual degree of profitability? How sustainable are they? What risks are associated with the operating profit stream? How highly levered is the firm? What is the firm's funds flow picture? What are its major sources and uses of funds? Are funds required to finance expected growth? How great are fund flows expected to be, relative to the debt service required? Given the possible volatility in those fund flows,

how likely is it that they could fall to a level insufficient to service debt and meet other commitments?

4.4 What Lenders do not Like - Early Warning Signs of Financial Distress

Bankers will not only analyse the information you provide about in your business plan but they will also carry on investigations on the industry and will try to obtain references about your company from your business partners and from their fellow bankers. They will check the national databases related to borrowers' debt levels and repayment history, general transactional behaviour and existing liens on your business assets. Examiners of your loan application will be carefully reviewing your financial statements and their dynamics over time looking for indicators or signs of poor or deteriorating creditworthiness. You should be prepared to provide comprehensive explanations and documented answers to their questions. The indicators listed below will help you understand what the examiners would be looking for to detect an imminent problem. The list is only a sample of 'red flags' that require attention.

Debt

- Material increase in long term debt that causes dependence on cash flow and longer term operating performance to support repayment of long term debt.
- Irregular debt payments, or unusual or too frequent extensions of terms of payment, credit renewal with little or no principal reduction, renewal with capitalised interests, and credits with high interest rate compared to market rate.

Balance sheet and income statements

- Longer collection period: this symptom indicates that borrowers intend to extend debt repayment and soften collection practices, which may lead to cash flow problems.
- Noticeable increasing level of inventory, both in terms of amount and percentage to total assets. Normally, increases in inventory will be supported by suppliers, and thus increasing the risk if turnover ratios are declining.
- Increases in inventory levels or lower turnover ratios may also result from reluctance to liquidate excessive or obsolete goods at a reduced price as most businesses are willing to sacrifice liquidity to maintain profit margins. Such situations may eventually lead to cash flow problems.
- Decreasing inventory turnover: indicate overbuying or imbalance purchasing policy. Many times, decreasing inventory turnover arises from a decline in sales. If the inventory value is undervalued, the actual inventory turnover will even be slower (longer) than the calculated results.

Cash

- Existence of heavy liens on assets: holding of second and third lien on assets is a sign of greater-than-normal risk. Funding cost is usually high. Most borrowers are reluctant to use this source of funds unless other reasonably

priced funding sources are available. Such businesses are typically over-leveraged and cannot withstand economic pressures from economic downturn for too long.

- Concentration of non-current assets other than fixed assets: borrowing companies may use the funds to invest in affiliates or subsidiaries. For this type of lending, financial institutions should have adequate information and credit analysis and structure it as direct lending. Lending to subsidiaries should have collateral other than a guarantee from parent company.
- High level of intangible assets in the balance sheet: such as goodwill. The value of these assets is uncertain and may shrink much more quickly than tangible assets. However, some intangible assets such as patents or trademarks do have high value and should be incorporated in credit risk analysis.
- Significant difference between gross and net sales: such difference indicates the level of product returns and reserves. Lower product quality, customer dissatisfaction in borrowers' products may affect borrowers' profitability due to slower sales.
- Increasing percentage of cost: indicates businesses' inability or unwillingness to pass higher costs to customers or inability to control cost.
- Rising level of total assets compared to sales: when borrowers expand their businesses, there is a need for more current assets in the form of inventory, receivables, and fixed assets. Examiners should pay attention to the case when the asset growth of borrowers' assets is higher than the sale growth since efficiency may decline.
- Declining trend in sales and profits, rapidly increasing expenses, dividend payments inappropriate to operating performance, increasing level of debt to net worth, increase in operation net worth solely from revaluation of fixed assets.

Flow documentation

Negative cash flow, cash flow projections that indicate inadequacy in principal and interest payments, as well as statements reflecting cash flow from sale of fixed assets or special items that are nonrecurring business situations or lack of cash flow statements or projections.

4.5 Types of Securities and Coverage Rates Accepted by Banks

Besides scrutinising the long-term outlook for your business and examining your ability to repay the loan, lenders will also require collateral to secure the loan. In case you failed to repay the loan, they would recover the amounts due liquidating the collateral/securities. Banks normally require a coverage rate of 105-120% (meaning that the securities package will cover between 105 - 120% of the value of the principal plus the interest due for the first 6 - 12 months).The securities can be categorised depending on their liquidity and volatility. Depending on the type of loan you are applying for, bankers may prefer/require one type of collateral or another. After undergoing an evaluation process the proposed security will be allocated a risk degree and an accepted value. Here are some examples of securities/collateral required by banks and their accepted value.

Collateral	Liquidity	Risk Degree	Accepted Value
Cash collateral Certificates of deposit	Most liquid	0	100%
State Guarantee Letters of Guarantee issued by A ranked banks	Most Liquid	0	100%
Letters of Credit (proceeds from L/Cs available with the lender)	High	20%	80%
Mortgage on land and buildings	Medium to high	50-0%	50-100%
Pledge with/without dispossession on business assets, equipment, inventory, shares, shipping documents, etc.	Medium to low	70-30%	30-70%
Corporate Guarantee Letter of Comfort from the parent company	Depending on the borrower	Depending on the borrower	50-100%
Assignment of receivables (proceeds from commercial contracts)	Depending on the contracts	Depending on the contracts	Max. 80%

4.6 Typical Documents and Information Required for the Bankable Dossier

When applying for a loan, you will have to submit to the Bank a formal request of your company stating the requested terms of financing (amount, object, validity, availability, grace period, reimbursement schedule, securities proposed) accompanied by a whole range of documentation. Each bank will have its own requirements, so please regard the following list and indicative only.

Corporate legal documents

- Articles of incorporation and/or other foundation documents (such as shareholders' agreement, partnership agreements)
- All amendments to the above-mentioned documents and proof of their official registration
- Certificate of incorporation, including the sole registration number
- Approval for the conformance to the environmental standards of nature protection, occupational and industrial safety. Recent (few days prior to the credit request) Trade Register Certificate reflecting the current status of the company (share capital, shareholders' structure, managers, business assets, etc.)
- Recent (few days prior to the credit request) Fiscal Record
- Copies of the identification documents for the company's legal representatives designated to act on behalf of the company in the relationship with the Bank
- Resolution of the competent Decisional Bodies (Board of Administration / General Assembly of Shareholders / Local Council Decision), authorising implementation of the project (financing or guaranteeing) and designating the persons in charge with negotiation and signing of the related documentation document to be provided before any loan withdrawals are made.

Financial and business related information

- Main shareholders (name, participation, age, any other relevant information) in the form of a short resume
- Management team: Details of Board of Directors, number of full-time directors and their responsibilities, qualifications, experience of the Chief Executive and of the functional executives
- Market description, competition analysis, sales strategies and marketing approach
- Income and expenses budget and the cash flow statement for the entire validity of the loan
- Latest available audited financial statements. In case the facility is backed up by corporate guarantee or letter of comfort (from the mother company), the client should also provide the audited financial statements of the guarantor
- Latest available year-end balance sheet and the latest available trial balance together with the corresponding trial balance of the previous year (e.g. December 2010 and December 2009)
- Details on the latest available trial balance accounts related to customers, suppliers, inventory, debts to the state budget, other credit facilities or contingent liabilities, leasing facilities, shareholder loans
- Description of the company's business cycle - average collection period, average payment period, inventory turnover
- In case of rescheduled debts to the state budgets, a copy of the rescheduling agreements
- In case of shareholder loans, a copy of the shareholder loan agreements accompanied by a duly signed and stamped letter mentioning the outstanding amount at the date of the loan application and at the moment of the last financial reporting (year-end or half-year)
- The existing evaluation reports for the proposed collateral, if any
- Group companies, their operations and the debt exposures
- Particulars of other projects promoted/implemented by the company in the particular industry (to understand your track record in project execution).

Investment documentation

- Feasibility study for the investment project
- Discounted cash flow of the investment project
- Copies of any contracts, pre-contracts, letters of intent with the constructors, suppliers, clients or any other parties involved in the development of the project
- Copies of the required licenses and permits for the development of the project.

4.7 The Bank's Financial Appraisal – Project Appraisal

When potential lenders conduct a financial appraisal of an energy efficiency project they will normally review the estimated cost of the project, proposed means of financing, financial and cash flow projections and the viability indicators provided by the borrower or by the feasibility study presented together with the bankable

documentation. They will also conduct a sensitivity analysis to check whether the project remains feasible under adverse evolution of various parameters.

Reviewing project costs

Realistic estimates should be used on various components of the project cost so as to prevent cost over-runs and to avoid over-estimation of costs. As well as the cost of the project itself, preliminary expenses, equipment cost, cost of land and buildings, contingencies, design and engineering fees and interest during the construction period should all be taken into account.

Preliminary expenses

The preliminary expenses consist mainly of the cost of conducting energy audits and the cost of preparing project feasibility reports. These preliminary expenses should be capitalised and amortised over the tenure of the loan.

Equipment cost

Equipment cost estimations should be based on quotations/purchase contracts between the applicant and the suppliers. These contracts should be finalised after obtaining competitive quotations from a few suppliers. The selection criteria should not solely focus on price, but also on appropriateness of the technology, reputation of suppliers, delivery periods, credit terms, etc. The cost estimates would be scrutinised to ensure that taxes and duties, insurance, freight charges, etc. are included and detailed breakdown has been provided. Provision should be made for installation and spares.

Design and engineering fees

A breakdown of design and engineering fees, and erection and commissioning charges should be obtained from the borrower and appended to the project feasibility report.

Interest during construction period

Interest during construction refers to an amount equivalent to the interest and other charges payable by a borrower to the Bank at an agreed rate during the construction period of the project (interest due during the loan grace period). The interest during construction period should be capitalised and included in the cost of the energy efficiency project.

Contingencies

Certain unforeseen expenses or losses that may increase the project cost estimates, such as increase in duties, taxes and foreign exchange fluctuations. Although a proper estimation of the costs of contingencies is difficult, generally it is prudent to keep 5 - 10% of the project cost for contingencies.

4.8 Loan Granted: Now What?

4.8.1 Project Implementation Monitoring Plan

The Bank has the right to monitor the project implementation progress in order to detect implementation risks at an early stage. On demand corrective measures, freezing or a stop of the disbursement/ financing is in the discretion of the Bank.

The project manager at the lenders site must be fully aware of the implementation and responsible for the submission of the Report on Progress of Project Implementation to the Bank.

The preparation of the Report on the Progress of Project Implementation shall not generate high (additional) effort or burden for the lenders project manager. For this RUSEFF Partner Banks provide their clients with a checklist to report on the progress of the project. Besides this the project progress can be documented by providing documents (evidence), e.g. supplier contracts, invoices, commissioning protocols, etc.

The provided information on the implementation progress shall be correct and reflect the truth. The lender is fully responsible for the project implementation and information to the bank.

Project Monitoring by a Bank

Monitoring will take place at least on two levels:

- Monitoring the technical implementation of an individual energy efficiency project until completion according to the implementation plan and completion report
- Monitoring of the project benchmarks.

Monitoring project implementation

Monitoring project implementation is based on the completion report. Typical milestones are:

- Specification of equipment and works,
- Preparation of tender dossiers, tendering of works and equipment
- Evaluation of tenders, contract with suppliers
- Delivery of equipment / implementation of works (if necessary in several stages)
- Completion of installation.

Benchmark monitoring

Benchmark monitoring will track and review actual project performance and results to project plans, revise the project plan to reflect accomplishments thus far, and to revise the plan for remaining work, if needed provide visibility into progress as the project proceeds, so that the team and management can take corrective action early when project performance varies significantly from original plans. Monitoring of the

performance of the individual projects over time is a key issue. The costs of monitoring will be covered by the investor.

The bank will counter check these report. Indicators will include, for example:

- The physical and monetary energy savings resulting from the investments financed by bank.
- Other cost savings connected with the investment
- Technical performance of the equipment
- Problems occurred
- The associated emissions reductions of local air pollutants.

4.8.2 Required Information from the Bank

If the project is financed through one of the EBRD programs. It is the obligation of the Project Consultant to monitor the implementation progress of the loan projects and report to the Bank and EBRD in:

- Regular intervals (monthly)
- In case of considerable delay of breach of terms of the loan contract the Project Consultant will follow up and analyse the monitoring reports, and will notify the Bank - on demand - on arising risks (delay of revenues, cash flow variations, and liquidity gaps).

4.8.3 Key Milestones and General Indicators for Fulfilment

Completion of Engineering, design

Technical specification, bill of quantities, implementation design, documentation, consolidated procurement plan

Completion of tendering of works and equipment

Identification of potential contractors, tendering of main equipment, tender receipt / evaluation, review of investment plan, delivery contracts, revising contract implementation schedule

Start construction work

Obtaining all necessary permits, licences, etc., preparation of the construction site/office, coordination of transport (storage, site, road access), dismantling of old equipment, infrastructure preparation

Delivery of equipment

Management of deliveries and storage, delivery of goods/shipment documents, inspections and tests, change orders, key documents for supervision job are: invoice, shipping or works list, CMR, certificate of origin, certificate of quality

Installation of the equipment

Assembly, installation, installation connection to system, completion of works, safety assessment and approval.

Commissioning

Certificates of acceptance of works signed by the consultant, the supplier/contractor, the client and end-users, test run of systems, adjustment operation mode, acceptance certificate of installation, as-built drawings, O&M manuals, etc., acceptance and completion certificates.

Operation start

Coordination of production requirements, operation management, recruiting and training of operation personnel.

Indicator	Amount	Unit	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Electricity price	0.06	USD / kWh	0.060	0.063	0.066	0.069	0.073	0.077	0.080	0.084	0.089	0.093	0.098	0.103	0.108	0.113	0.119
Natural gas price	0.094	USD / m3	0.094	0.099	0.104	0.109	0.114	0.120	0.126	0.132	0.139	0.146	0.153	0.161	0.169	0.177	0.186
Price growth	*5%*																
a) Installation of new equipment for electric arc furnance																	
Steel production volumes	37,300	tonnes		37,300	37,300	37,300	37,300	37,300	37,300	37,300	37,300	37,300	37,300	37,300	37,300	37,300	37,300
Electricity savings	235	kWh / tonne		8,765,500	8,765,500	8,765,500	8,765,500	8,765,500	8,765,500	8,765,500	8,765,500	8,765,500	8,765,500	8,765,500	8,765,500	8,765,500	8,765,500
Investment total	1,721,479	USD															
Cash flow		**USD**	**-1,721,479**	**552,227**	**579,838**	**608,830**	**639,271**	**671,235**	**704,797**	**740,036**	**777,038**	**815,890**	**856,685**	**899,519**	**944,495**	**991,719**	**1,041,305**
IRR	**36.2%**																
NPV	**3,240,616**																
b) Replacement of old compressors																	
Average air demand	650,000	m3 / year		650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000
Electricity savings	0.82	kWh / m3		533,000	533,000	533,000	533,000	533,000	533,000	533,000	533,000	533,000	533,000	533,000	533,000	533,000	533,000
Investment total	356,841	USD															
Savings amount		**USD**	**-356,841**	**33,579**	**35,258**	**37,021**	**38,872**	**40,815**	**42,856**	**44,999**	**47,249**	**49,611**	**52,092**	**54,697**	**57,431**	**60,303**	**63,318**
IRR	**8.3%**																
NPV	**-32,189**																
c) Reconstruction of thermal kiln																	
Steel treatment volumes	16,000	tonnes / year		16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000
Natural gas savings	41.9	m3 / tonne steel		670,000	670,000	670,000	670,000	670,000	670,000	670,000	670,000	670,000	670,000	670,000	670,000	670,000	670,000
Investment total	262,618	USD															
Savings amount		**USD**	**-262,618**	**66,129**	**69,435**	**72,907**	**76,553**	**80,380**	**84,399**	**88,619**	**93,050**	**97,703**	**102,588**	**107,717**	**113,103**	**118,758**	**124,696**
IRR	**28.7%**																
NPV	**336,726**																
Energy Efficiency Project																	
Total Investment	**2,340,938**																
Project Cash Flow			**-2,340,938**	**651,935**	**684,531**	**718,758**	**754,696**	**792,430**	**832,052**	**873,655**	**917,337**	**963,204**	**1,011,364**	**1,061,933**	**1,115,029**	**1,170,781**	**1,229,320**
Cumulative Cash Flow			**-2,340,938**	**-1,689,004**	**-1,004,472**	**-285,714**	**468,981**	**1,261,412**	**2,093,464**	**2,967,118**	**3,884,456**	**4,847,660**	**5,859,024**	**6,920,957**	**8,035,986**	**9,206,767**	**10,436,086**
IRR	**31.7%**																
NPV	**3,545,152**																