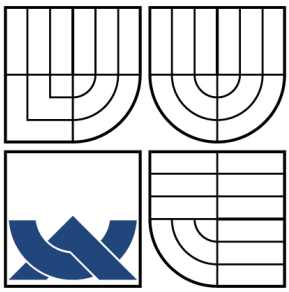
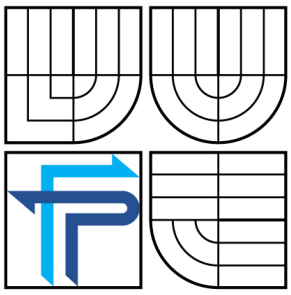


VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ

BRNO UNIVERSITY OF TECHNOLOGY



FAKULTA PODNIKATELSKÁ

ÚSTAV EKONOMIKY

FACULTY OF BUSINESS AND MANAGEMENT

INSTITUTE OF ECONOMICS

THE EVALUATION OF THE CONSTRUCTION AND RUNNING OF A PHOTOVOLTAIC POWER PLANT

NÁVRH A ZHODNOCENÍ VÝSTAVBY A PROVOZU FOTOVOLTAICKÉ ELEKTRÁRNY

DIPLOMOVÁ PRÁCE

MASTER'S THESIS

AUTOR PRÁCE — Bc. JAN VOZÁR

AUTHOR

VEDOUCÍ PRÁCE — doc. Ing. STANISLAV ŠKAPA, Ph.D.

SUPERVISOR

BRNO 2009

Vysoké učení technické v Brně
Fakulta podnikatelská

Akademický rok: 2009/2010
Ústav ekonomiky

ZADÁNÍ DIPLOMOVÉ PRÁCE

Vozár Jan, Bc.

European Business and Finance (6208T150)

Ředitel ústavu Vám v souladu se zákonem č.111/1998 o vysokých školách, Studijním a zkušebním řádem VUT v Brně a Směrnicí děkana pro realizaci bakalářských a magisterských studijních programů zadává diplomovou práci s názvem:

Návrh a zhodnocení výstavby a provozu fotovoltaické elektrárny

v anglickém jazyce:

The Evaluation of the Construction and Running of a Photovoltaic Power Plant

Pokyny pro vypracování:

Úvod
Vymezení problému a cíle práce
Teoretická východiska práce
Analýza problému a současné situace
Vlastní návrhy řešení, přínos návrhů řešení
Závěr
Seznam použité literatury
Přílohy

Seznam odborné literatury:

FOTR, J. Podnikatelský záměr a investiční rozhodování. 1. vyd. Praha: Grada, 2005. 356 s. ISBN 80-247-0939-2.
KEŘKOVSKÝ, M. Podnikatelský projekt. 4. vyd. Brno: VUT v Brně, 2000. 54 s. ISBN 80-214-1690-4.
KORÁB, V.-PETERKA, J.-REŽŇÁKOVÁ, M. Podnikatelský plán. 1.vyd. Brno: Computer Press,a.s., 2007. 216s. ISBN 978-80-251-1605-0.
MÁČE, M. Finanční analýza investičních projektů. 1. vyd. Praha: Grada, 2006. 77 s. ISBN 80-247-1557-0.
VALACH, J. Investiční rozhodování a dlouhodobé financován . 2. přeprac. vyd. Praha: Ekopress, 2006. 465 s. ISBN: 80-86929-01-9.
WUPPERFELD, U. Podnikatelský plán pro úspěšný start. 1. vyd. Praha: Management Press, 2003. 159 s. ISBN 80-7261-075-9.

Vedoucí diplomové práce: doc. Ing. Stanislav Škapa, Ph.D.

Termín odevzdání diplomové práce je stanoven časovým plánem akademického roku 2009/2010.

L.S.

Ing. Martin Slezák	doc. RNDr. Anna Putnová, Ph.D., MBA
Ředitel ústavu	Děkan fakulty

V Brně, dne 22.12.2009

Abstract

This dissertation discusses the problematic of the construction and running of a photovoltaic power plant in the conditions of the Czech Republic. The dissertation is created by parts theoretical, and conceptual. In the theoretical part the fundamentals, which are applied in following part are discussed. Analytical part discusses the business project and its evaluation in general. The conceptual part discusses the own concept of the photovoltaic power plant planned to be build by the company ABC Ltd. and gives recommendation.

Abstrakt

Tato diplomová práce se zabývá problematikou výstavby a provozování fotovoltaické elektrárny v podmínkách České republiky. Diplomová práce se skládá z části teoretické, a návrhové. V části teoretické kde jsou rozebrána teoretická východiska, která jsou následně aplikována v dalších částech. Část návrhová obsahuje vlastní návrh fotovoltaické elektrárny kterou plánuje vybudovat společnost ABC s.r.o. a dává doporučení.

Key words

Business plan, photovoltaic power plant, investment, net present value, internal rate of return, pay back period, economic value added.

Klíčová slova

Podnikatelský záměr, fotovoltaická elektrárna, investice, čistá současná hodnota, vnitřní výnosové procento, doba návratnosti investice, přidaná ekonomická hodnota.

Bibliographic citation

VOZÁR, J. *Návrh a zhodnocení výstavby a provozu fotovoltaické elektrárny* . Brno: Vysoké učení technické v Brně, Fakulta podnikatelská, 2010. 79 s. Vedoucí diplomové práce doc. Ing. Stanislav Škapa, Ph.D.

Author´s declaration of thesis originality

I declare, that the master´s thesis on the topic Evaluation of Construction and Running of a Photovoltaic Power Plant, I worked out independently with using cited literature and data.

In Brno, 8. 1. 2010 .....

Acknowledgement

At this place I would like to thank to doc. Ing. Stanislav Škapa Ph.D. for his valuable recommendations during the process of writing my master's thesis, and also to the employees of the company ABC Ltd. for their willingness.

Poděkování

Na tomto místě bych rád poděkoval doc. Ing. Stanislavu Škapovi Ph.D. za cenné náměty a připomínky při zpracovávání mojí diplomové práce jako i zaměstnancům společnosti ABC s.r.o. za jejich vstřícnost.

1 List of content

2 Introduction

The issue of assessing the effectiveness of an investment is extremely important for any company. The investment is one of the bridges between the present and future business development. Investment decisions are therefore one of the most important and also the most difficult activities, which must be done by the owners and management of an enterprise, because in a market economy is the main criterion of success of each activity the economic efficiency. Only the right decision based on relevant information enables a healthy development and a dynamic growth of a company in the competitive environment.

The purpose of the investment decision making is to collectively analyze all economic effects that a particular investment caused by its implementation, and assess their overall contribution to the company. Only on the basis of this information may be responsible to decide on acceptance or declination of an investment.

Each investment project agreed to be implemented affects future expenses and revenues, and business start-up phase represents a significant capital burden. Hence, investment decisions must necessarily be followed by financial decision. Its purpose is to provide sufficient financial resources to realize the investment. Financing of the investment activity is an important part of successful implementation and operation of long-term investment project.

We are living in globalized times, when people are surrounded by modern means of communication, flooded by information on global climate change and commitment of irreparable damage to the environment. The question is, if the information provided is based on facts or misleading demagogy. For example our president Václav Klaus says in his books, that the global climate change is nonsense. But the fact is that the effect of a strong media coverage and constant repetition of these topics have already appeared. The result is the rise of so-called ”green technologies”. This is possible only due to big support of the European Union, which made a law, that the owners of distribution grids are required to buy electricity from “green” producers at much higher prices than the market price is. The price is guaranteed for 20 years and this support gets big promotion. This is appealing to many people as the companies which build photovoltaic

power plants use simply calculation of payback period neglecting many factors, such as operating costs, time value of money, taxation, inflation etc.

3 Objective and specification of the thesis

The main objective of the diploma thesis is evaluation of an investment project of building and running a photovoltaic power plant in the conditions of the Czech republic. An investment project is very broad issue, then it is necessary to explain its parts and methods of evaluation such as the Payback period, NPV, IRR and EVA in the theoretical part.

In the beginning of practical part is an overview of photovoltaic in the conditions of the Czech republic, followed by a process of construction of a photovoltaic power plant in the conditions of the Czech republic, followed by PEST analysis.

Afterwards I introduce the company, mention deadlines, then indentify the operational, investment and financial risk, and evaluate situation by SWOT analysis.

In the next part are described expected cost and revenues. In the final part are set three possible variant of development of the external environment such as industry inflation, corporate tax rate, etc. and analysed by following methods: Payback period, discounted payback period, NPV, adjusted NPV, IRR and EVA.

THEORETICAL PART

4 Business activity

Main focus of the business activity is creation of profit, that is created by revenues bigger than costs. Profit can be made by satisfying of customer needs. In the beginning of each business activity must an entrepreneur invest into business activity some capital, either his own or borrowed. The entrepreneur focuses on appreciation of the capital invested. Needs of customer the entrepreneur satisfies with his product or service on markets, where he has to face risk (Synek, 2006).

5 Business plan

The business plan is a conception of a company in written form and its focal point are quantitative statements about the company's perspective, development possibilities and anticipated risks (Wupperfeld, 2003).

In the beginning of any effort to realise a business project should be the business plan. It has two main purposes (Fotr, 2005):

- Inside the organization-it's used for managing of the company
- Outside the organization-usable when the company wants to finance the investment from foreign funds

Importance of this document is crucial, when the company is trying to use financing from foreign funds. To be successful at this task, there are recommended following rules (Wupperfeld, 2003):

- Business conception must be realistic and consistent
- Business plan must be persuadable and easy to understand. It must not include any discrepancies.
- The market for the product must be big enough
- Must be clearly explained, why is the product supposed to be successful
- Each plan must be based on real facts

- Bank’s specially focus on management, because the success of the business project depend on abilities of the management to realise the business conception

Usually is required information about (Fotr, 2005):

- Company history
- Business target
- Legal relationships
- Management
- Product
- Market situation
- Planning
- Needs for funding
- Expected revenues, opportunities and risks

Business plan also helps us to indicate business success. We simply compare our business plan with the reached reality and find out, whether were our targets met or not. It provide us with feedback.

Business plan usually consist of following parts (Struck, 1992):

- Descriptive part-explains connections, assumptions and planned procedures
- Numerical part-explains impact of the assumptions and procedures on number of employees, turnover, investment, liquidity and profit
- Appendix-consist of market researches, calculations, contracts, pictures and another information.

The structure of business plan is not strictly given as each company is different from the point of view of the industry in which is active, size and type of management. For this reason doesn’t exist any typical plan applicable universally for all companies. The structure of it can look for example in following way (Struck, 1992):

1. List of content
2. Executive summary
3. General description of the company

4. Key persons and organization of the enterprise
5. Products or services
6. An analysis of the market and prognosis of turnover
7. Distribution
8. Production
9. Deadlines
10. Financial plan
11. Funding
12. Appendix

5.1 Universal process of designing the business plan

At the beginning we must answer three basic questions, relating to the merit of the business plan (Koráb, Peterka, Režňáková, 2007):

- **Where are we now**

  Here is needed a proper analysis of the situation, in which the company is. It's a strategic analysis of factors, that have serious impact on the company. We must get understand our product, compare our product with the products of the competition and by doing so find out in what is our competitive advantage. We must get understand our customers, to know what they want, what they need and why they buy from us and not from our competitors. Find out our strengths, weaknesses, opportunities and threats.

- **Where we want to move**

  We have to know the answer for the question, where we want our company to move. It's not only about situations connected with next development but about situations connected to defence strategy of the company and the quest to stay on the market.

- **How we want to move there**

  We must specify individual types of sources or methods, which are necessary for achieving the desired objectives. Create a strategy for achieving the objectives set. We coordinate different areas of human resources, capital, marketing, etc. We prepare a marketing plan for development of the marketing mix in each action.

Prepare a financial plan in terms of sales and profit estimates for the idea of filling the plan.

5.2 Starting budget

In the implementation of the business plan we must in addition to processing business plan draw up the starting budget. The purpose of the budget is specifications and quantification necessary resources, which must be invested into the company before we start earning.

Content usually includes following (Veber, Srpová, 2005):

- Inventory of tangible and intangible assets required to start the firm
- Quantification of the amount of assets needed in the early stages of the business before the company starts to generate money
- The anticipated range of revenues, costs and profits-this calculation is recommended to create in a number of possible options from pessimistic to optimistic perspectives
- Establishment of the expected flow of cash
- Expected return on capital employed.

Entrepreneur compiling the budget should not forget that in addition to initial starting costs directly related to the establishment of the company are arising also periodic expenses in connection with the operation of businesses, such as rent, salaries,
insurance, fees, expenses for energy, water, promotion, which are not in starting phase matched by revenues. This should counted in a statement of expenditures and revenues in the initial period, so that on the one side does not lack of cash liquidity of the company and on the other hand, doesn't keep too much money in low-yield assets. By drawing up the starting budget obtains the entrepreneur overview of the need for financial funds in the early stages of development of the company, from the start, through the initiation to the stabilization and normal operation (Broadbent, 1997).

6 Investment

According to Toffler (2001), we live in turbulent times, ie. full of changes, shocks and conflicts (technological, technical, political, environmental, etc.). Leading the company in the right direction, ie. setting vision, goals and appropriate ways to achieve them is a prerequisite for survival and a prerequisite for success.

Prerequisite of investment is the sacrifice of current consumption to gain the future, less certain values. In business practice, it is spoken about capital expenditures, which are over a period of time(usually longer than 1 year) transformed into cash proceeds, which can be used for subsequent consumption or other investments, which is, after all, inherent in every economic entity. Capital expenditures are, in principle, any means which the company spends on other than the normal operating activities. It are expenses, which create conditions for growth business and its profits, to raise awareness of the corporate portfolio and the growth of its popularity and to increase the satisfaction of all stakeholders[1] (most often given as expenditure on rehabilitation and expansion of fixed assets, expenditure on advertising campaign, spending on education and incorporation of workers seeking funds for research and development programs, etc.) (Valach, 2006).

According to Synek, (2006) the investment is distributed into three basic categories:

- **tangible**, such as purchases of property, plant and equipment (production capacity of the company)
- **intangible**, which is mostly software, know-how and training expenditure, research
- **financial**, ie. the acquisition of securities, stocks, bonds, or providing cash funds to other companies for the purpose of obtaining income (dividends, interest)

Depending on increase in the size of the business (and offer), we can divide investment (or investment projects) into the following groups (Fotr, 2005):

[1] Stakeholder are all persons involved in the business that are besides the owners and managers, employees,
suppliers, customers, state, city etc.

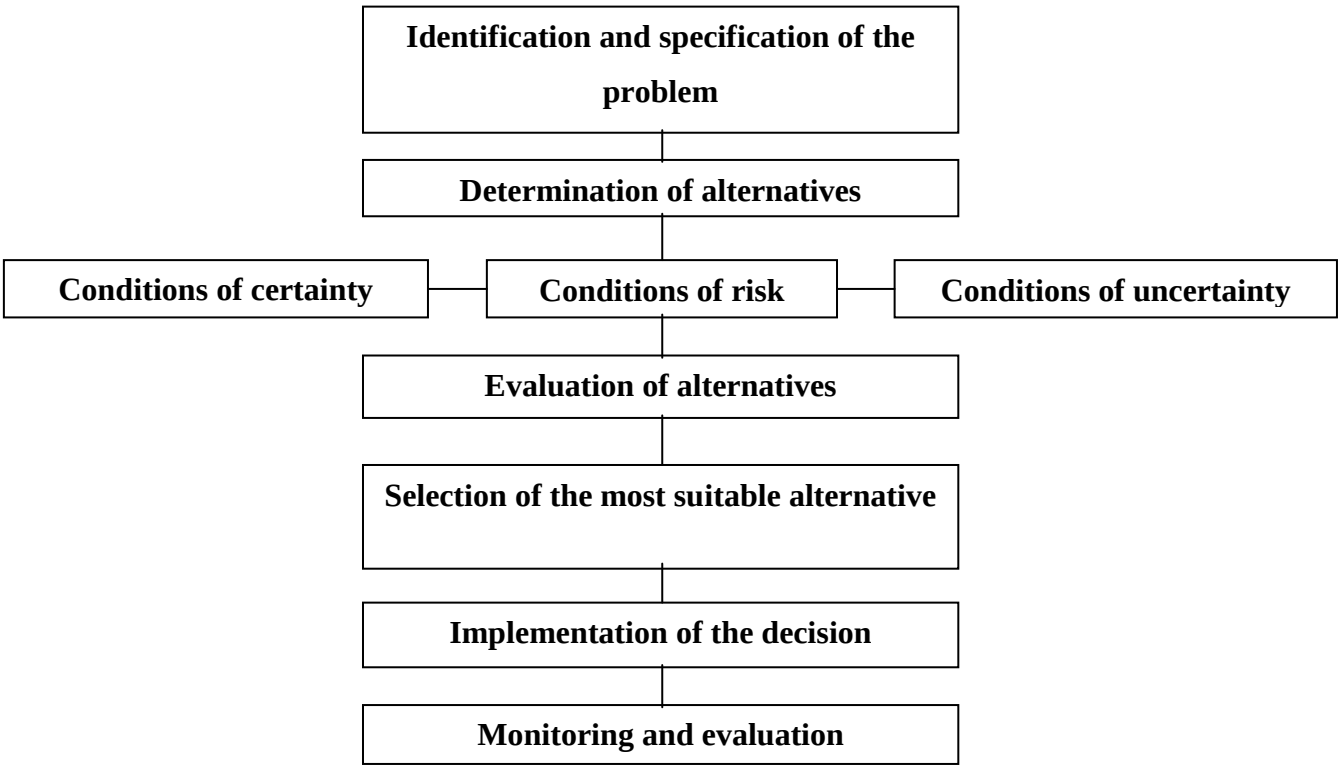
- **Development (expansion) investments**, which are directed at expanding the company, increase volume of production, or introducing new products and services. A common effect of these investments, is sales growth
- **Refreshing investments**, its task is the replacement of obsolete production facilities, whether before the end of their life or after. This type of investment allows the company maintain the current production program, or make it more effective (most savings costs, improving quality of production)
- By the entry into the EU domestic enterprises were also obliged to meet a wide range of regulations in various areas (eg. hygiene, ecology). In the context adaptation to European (and domestic) legislation, therefore, the speech is about the third kind of investments, investments which are mandatory.

Investment decisions is one of the most important business activities of company management. In the investment decisions lies the future survival of the company and its prosperity and profitability. Incorrect decision may undermine long-term activity of the company or even cause its bankruptcy. In the light of uncertainty that accompanies the investment decisions, corporate management must pay high attention to investment decisions (Valach, 2006).

6.1 Decision making process about investment

There are many approaches to decision making which depend mainly on the nature of the issues, time and the capabilities of the manager. Decisions can be considered as a tool rather than desired result. It is a process by which the manager wants to achieve the desired state. The result of a decision-making process is a decision. Every decision is the result of a dynamic process that is influenced by many factors (organizational environment, management skills, motivation, etc.). The more this is an isolated problem, and the more results will be affected by uncertainties, the decision-making process will be implemented comprehensively. For the purpose of investment decisions can be noted the general scheme for decision-making process (Bammer, 2008).

Picture 1 Scheme of decision making proces about investment



Source:Adapted from Bammer, 2008

6.1.1 Identification and specification of the problem

The root of solving any problem is to identify the problem. There are several indicators that can show a problem in the company (Kepner, 2006).

- Deviation from previous performance
- Deviation from the plan
- External criticism

It is easy to recognize the emergence of the problem, if there is a significant difference between the desired and actual results. However, it is difficult to specify the problem for several reasons (Bammer, 2008):

- the perception of the problem - everyone sees the problem individually, subjective
- specification of the problem by solution - sometimes the problem is specified by the chosen solution
- identification of symptoms as a problem - it is necessary first to identify problem and then specify the symptoms

6.1.2 Determination of alternative solutions

If we define the problem, we can start looking for all possible options to address it. This needs to gather all relevant information relating to the issue. Usually, the more options we have, the faster it reached final decision. Logical consequence of determining the options, is the detection if it is suitable to make the investment (Bammer, 2008).

6.1.3 Evaluation of alternative solutions

This stage of the decision-making process is comparison of proposed alternatives and their evaluation. We need to find the most reasonable option to bring best results and eliminate the most negative consequences of its choice. It is appropriate to use other evaluation criteria such as minimizing costs, achieving greater customer satisfaction etc. (Bammer, 2008).

When evaluating alternatives, there are three following situations (Bazerman, 2002):

- certainty - the decision maker has complete knowledge of the possible consequences of alternative choices

- risk - the decision maker has estimated knowledge of the possible consequences of alternative choices
- uncertainty - the decision maker has no information about with what probabilities may arise the consequences of selecting any of the various options

6.1.4 Selection of the most suitable alternative

The purpose of any decision making process is to achieve the decision ie. the decision making process is not the ultimate goal, but only the way to achieve it. Each option usually affects both negative and positive next goals. Therefore, if one achieved the optimum results for the second objective is unlikely to be achieved at the best possible outcome.

It is necessary to take into account the priorities and consider the fact that you can optimally satisfy only one priority of the problem (Bammer, 2008).

6.1.5 Implementation of the decision

If we want to achieve the solution, it is necessary to effectively implement each decision. We must make sure, that the implementation of the decisions is made consistently. The quality of the implementation is often more important than the choice of suitable alternatives (Jones, 2004).

6.1.6 Monitoring and evaluation

Any effective management requires regular evaluation of results. If the difference between the actual result and the planned values (targets) differs significantly, then there is a need to take corrective measures. You need to think about alternative solutions, about implementation or otherwise about the fact if the target of the solution of the problem is realistic (Curwin, 2002).

6.2 Factors affecting investment decisions

Among the main factors that may affect the results of the decision of an investor, is the discount rate, tax rates, inflation and risk.

6.2.1 Discount rate

In some static methods and in all dynamic methods of assessment of the economic efficiency appears in the mathematical expressions a very important variable, which is called the discount rate or required return rate. This variable essentially represents the effect of time factor on the value of money, it serves to update the costs, revenues or cash flows of the investment project and its design is partially considered as a risk factor for investment. The return rate can be defined as ”the return that an investor requires as a minimum compensation for the postponement of consumption and compensation for risk-taking investment“(Valach, 2006).

6.2.2 Tax rate

As the discount rate affects the value of cash flow over time, the tax rate imposed on corporate income or production significantly affects the expected cash flows from investments. The whole issue of taxes and investment taxes can be divided into two areas:

- differences in the degree of a system of taxation of corporate income in different countries
- The actual development and prediction rates and tax laws in a particular country

All investment projects affects the tax rate on corporate income, since income tax is a real cash outlay, therefore most investors pay most attention. For investment projects with long economic life can have such a significant factor big influence on the final result of the decision, and therefore it is important to know, or at least estimate, how will the tax rate develop over time (Wickham, 2006).

6.2.3 Inflation

Another factor that may significantly affect investment decisions, is the inflation. It should be noted that for investments with long economic life even with predicted relatively low inflation, it has noticeable effects on cash income, but also for capital and

operating expenses. On the side of cash income it depends primarily on the growth of sale prices of products or services. On the side of capital and operating expenditure may be rising prices of raw materials, energy and wages.

In most cases, the theory simply assumes that the prices of the input and output are affected equally, and talk about the *neutral inflation*. It is important to realize that it is not possible to be based on the average national inflation, but the prices increase in various sectors and industries differently (Valach, 2006).

Inflation also affects the actual discount rate, the discount rate is due to inflation rising and we must distinguish between real and nominal discount rate.

For projection of the inflation in the discount rate we must stick to the basic rule: the nominal cash flows must be discounted by the nominal discount rate, the real cash flows must be discounted by the real discount rate.

6.3 Risk of an investment project

The risk of the investment project consists of many sub-risks that occur during particular business actions of a firm (Valach, 2006):

- the operational risk - the risk of machinery accidents, accidents, risk of strikes, etc.
- the market risk - the risk of sales, price trends, etc.
- the risk of innovation - the introduction of new products and technologies
- the investment risk - the risk in allocating money in tangible, intangible assets and long-term financial assets
- the financial risk - the risk arising from the use of different forms of capital, liquidity risk, the risk arising from changes in taxes, and interest rates

6.4 Capital planning

The investment decision-making is inextricably linked to long-term financing of investment. In the current theory and practice of this process is called capital planning. This activity includes following steps (Valach, 2006):

- Setting of long-term objectives and investment strategy of the firm
- Searching for new projects and preparation of pre-investment
- Development of capital budgeting and forecasting future cash flows
- Project evaluation from different perspectives inc. summary financial efficiency
- Selection of the optimal design
- Evaluation of completed projects

Like any activity of a manager the investment decisions and long-term financing specificities must be taken into account. Among the specific belong:

- Long time horizon - a decision with long-term consequences from the very beginning of the investment to the end of its life time
- Time value of money - it should be taken into account that the same financial sum has different value in time
- Risk - long-term brings uncertainty of cash flows in the future
- Capital intensively - we decide on a significant part of corporate assets
- Intensity of the subject and time coordination - the investment usually needs cooperation of many organizations, their activities must be coordinated to lead to the objective
- Application of new technologies - through the investment is carried out most of the technological innovations.

The basic premise of good investment decisions is the knowledge of corporate strategy, business objectives and financial capacity of enterprises.

6.4.1 Business objectives

In the economic theory, there are many views on the top business objectives. From the original idea that the ultimate aim of the enterprise is the long-term profit maximization, the majority of authors in the 80 and 90 years diverted. The reason was, that the profits did not reflect correctly the real behaviour of firms, because disregarded the time factor, the degree of risk, the difference between reported profit and the actual cash flow or the volume of capital with which the profit was achieved.

Currently, the majority accepted the view that the primary business objective is to maximize market value of the company.

In the latest so-called concept “stakeholders objectives” are not only the role of business development value for the owners but the responsibility lies for all the ”stakeholders“ – people involved in the business. The primary objectives of stakeholders, among which may arise conflicts can be considered (Broadbent, 1997):

- Efficiency and financial stability of the company
- Market share, maintaining and growing business
- Innovation production program, facilities, technology
- Wage and social security of workers, increase of their skills
- Protection of the environment, etc.

Considering these objectives is particularly limited objective of the owners, which remains dominant.

6.5 Capital expenditures

Projected capital expenditures, any cash outflows, which are awaiting conversion into future cash receipts, but occur not earlier than one year after the investment. Expenditure for which we expect cash revenue in one year, we call operating expenses. Usually the capital expenditure for tangible and intangible investments include (Valach, et al., 1999):

- expenditure on acquisition of land, buildings, machinery and equipment
- expenditure on a permanent extension of revolving assets in connection with investment
- expenditure on research and development related to the investment

The above costs can be further refined:

a) the income from the sale of existing property, which is being replaced by a new property

b) the tax effects associated with the sale of assets being replaced. Eg. if the sale generating revenue must be paid adequate tax

It should be noted that in constructing the capital expenditure, we should respect following principles (Valach, 2006):

a) The so-called. sunk costs should not be included in capital expenditures. It are costs that had to be made regardless of whether the project will be accepted or not, and not relevant for current investment decisions. For instance the costs of geological surveys of the site or the cost of a study on the impact of the project environment.

b) The cost of the sacrificed opportunities should be included in capital expenditures. These are cash flows that could bring the assets or resources, if not used in the project under consideration and would be used otherwise. It is such a loss of profit the long-term lease or the immediate sale of the parcel which is marked for project preparation. Capital expenditures, therefore, must be increased by these costs of sacrificed opportunities.

If capital expenditures occur in several years, it is necessary according to the chosen method of evaluation of effectiveness of the project take into account the time value of money and capital expenditure must be discounted.

6.6 Cash invoices

Definition of expected cash receipts from the investment is even more difficult than the determination of the capital expenditures. The economic life of most investment projects is expected from 5 to 10 years, sometimes more, forecasting cash receipts is very demanding. The prediction is significantly affected by the distribution and amount of expected cash receipts in time, but also other factors, among which we include inflation, changes in the tax system or trends in supply and demand in the market. All these factors can cause that the expected cash receipts for each year will not be the actual cash revenue. Because it happens very often, it is the most critical point of the process of analysis of the effectiveness of the investment project (Drury, 2008).

In the theory of the current financial management, the annual cash receipts received from the investment project during its lifetime consist of (Valach, 2006):

- profit after tax, which each year brings the project,
- the annual depreciation,

- changes in the current assets associated with the investment project
- income from sale of fixed assets at the end of life, adjusted of tax

If we want to be projected cash receipts each year as close as possible to the real, we follow the following recommendations (Ward, 1992):

1) Cash receipts should be based on incremental quantities, primarily on the growth of sales caused by the investment project. Therefore it is necessary to be based on quality plan of sales and production, we can determine the expected sales, as well as associated current costs which reduce income and are different from capital expenditures.

2) The cash receipts are affected by many factors over time, it is most appropriate create a prediction in several versions, depending on the factors significant for the project. For example, the changes in prices of inputs of production, inflation, or changes in tax legislation. Quantity of created variants is at the discretion of the analyst, but at least should be a variant of the expected developments in the market and the negative variant for the negative market trend.

3) Time factor appears even if the lifetime of the investment project. Here we distinguish the technical life of the project and its economic life. Economic life can never be more than technical, which is given by the real-life of the production facilities, but may be in many cases shorter. Economic life of the investment project is influenced by many factors, notably the extent of resources of raw materials needed for production, the size of demand and its course in time, life cycle of the product and the industry, the rate of technical progress, etc. Cash flow from investment project is always fixed only for economic viability. Since that the life time can largely influence the overall cash flow, it must be given increased attention.

4) The operating costs do not include interest costs. This approach is in the literature justified by the argument that the decision to adopt an investment project should be independent on the structure of sources of financing investment. And it is the structure of resources reflected in the amount of interest costs. When analyzing the project should there should be made two separate decisions in the levels of investment effectiveness

and cost of the resources. Another argument why not to include interest costs is the essence of discounting cash receipts. The discount rate already contains the cost of capital used to finance the project. Therefore, the inclusion of interest in the operating costs would result in double counting – one time when calculating the profit for the second time when discounting the revenues.

5) Cash flow should show taxing. Capital expenditure for the project is funded by sources after taxation, therefore the income from the project must be taken into account after tax. Different rates and tax systems in different countries influence the decisions of investors.

6) Tax depreciation of fixed assets required for the investment is an expenditure in the accounting, but not a real expense. Yet the costs are at their normal level impact on the tax on corporate profits. Therefore, when calculating the tax as an expense, but after determining the profit after tax, add them again as income, not as expenditure.

7) To determine the changes in the net working capital is needed to determine the current estimate current assets and current liabilities, which directly relate to the investment project. The increase in net working capital reduces cash receipts and contrast loss is increases. Experiences of preparation and subsequent implementation of investment projects show that demand for net working capital is significantly underestimated, or completely marginalized.

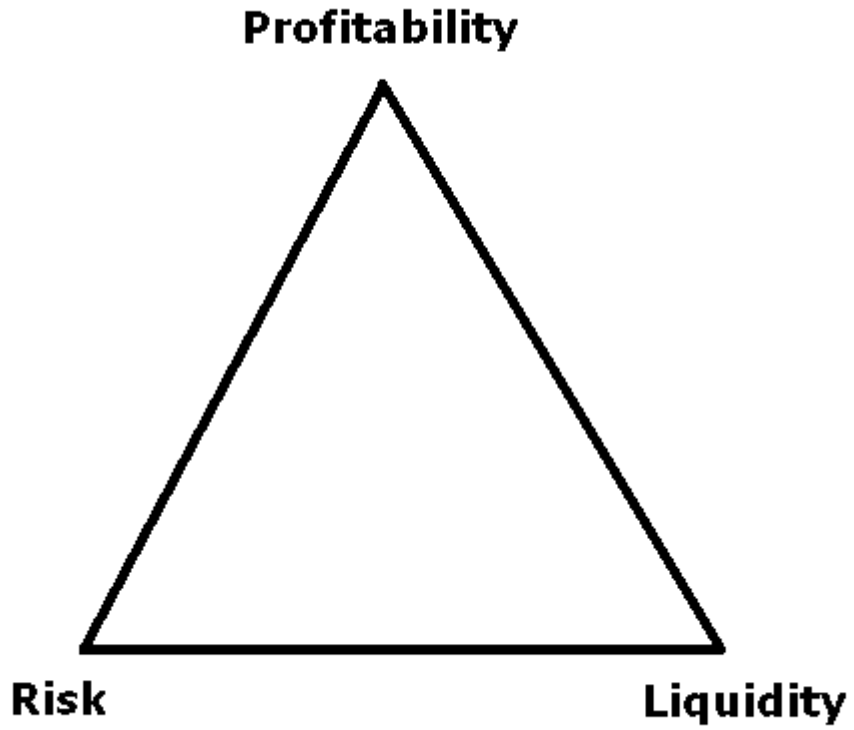
8) Income from sale of fixed assets occurs in those cases where there is, at the end of life of the investment project, the opportunity to sell the property at the market. In the case where the market price is higher than the accounting price, there is money income, which must be taxed. Therefore, then deduct tax on this income.

Very often we also find that the liquidation value of the project is not positive, but negative. In this case, the overall negative liquidation value must be subtracted from other incomes in that particular year.

6.7 Investment Strategy and Financing

Knowing business objectives, is a necessary condition but not sufficient, to achieve these objectives. To achieve the objectives is necessary a plan how to achieve them, ie. to create investment strategy.

Picture 2 Investors' triangle



Source: Máče, 2006

When choosing investment opportunities are deciding between profitability, risk and impact on liquidity of the company. Depending on which of the factors we prefer, we distinguish the following types of investment strategies (Máče, 2006):

- **Strategy to maximize annual revenue** - the investor prefers annual revenue from maintenance or increase investment rates, which can be applied in an environment of low inflation, where the investment is not devalued.
- **Investment value growth strategies** - the investor will give priority to the investment with expected growth in value and won't look at annual income, the income (profit) is realized on the sale of the investment

- **Strategy of high risk** - investors prefer investments with a high degree of risk (investment in less developed countries, new markets, ...) and for the risk undertaking expects higher profit
- **Conservative strategy** - investors prefer investments with lower but relatively certain profit (government bonds, money market deposits in banks, ...)
- **Maximal liquidity strategy** - the investor prefers the investment, which is possible in the short timescale transform into cash or other investment

Reversed side of the investment strategy is the **long-term financing strategy**, which focuses on financing of the investment. We distinguish the following strategies (Máče, 2006):

- **Conservative strategy** - marked by a higher proportion of long-term use of the resources also used to finance the short-term assets, reducing the risk, but also the profitability
- **Aggressive strategy** - offers a higher share of short-term use of resource which is also involved in the financing of fixed assets, thus giving a higher return at higher risk
- **Moderate strategy** - characterized by an effort to optimize the allocation of risk and return, which usually leads to financing fixed assets and permanent part of the current assets by long-term sources

Selection of the strategy affects a number of factors such as cost of capital, capital market, the relation to risk, property company structure, tax system, etc.

6.8 Factors for evaluation of investment projects

If the organization decides to invest, it usually chooses between different options. The alternatives differ in various technical and technological parameters. But the analysis of technical performance is not enough, for the evaluation of financial investments are crucial variables such as costs and revenues. The sense of the evaluation of economic efficiency of investment projects is return of capital invested. According to the method chosen, we usually compare the investment expenditure, with the effects of investments that can be both, cash expressible or inexpressible. The basic monetary effects are expressible cash income from investments, profit or cost savings (Davies, 2001).

Overall effectiveness of investment projects should be judged according to their contribution to the main objective of firm's business, which is typically maximising of its market value. Contribution to maximising of its market value express is best expressed by the criteria for evaluating the effectiveness of financial investments: net present value and internal rate of return. Apart from them are used other assessment criteria of investment projects, which use is limited because they express only certain financial views on the effectiveness and return on the project. Investment decision or selection of the project may be temporarily managed by other than financial criteria. A major deciding factor may be the fact that the company wants to enter a new market, to prioritize the rapid application of new technologies that will allow a competitive advantage in the future, there may be some fundamental business objectives of social aspects of the project, etc. The financial criteria, however, maintain leadership even in this multicriteria decision-making processes (Ward, 1992).

6.8.1 Methods for evaluation of economic efficiency

In order to answer the question whether we should realize the investment, we must first analyze how much the investment will effectively contribute to the strategic business objectives.

The basic and most used criteria for the distribution of individual methods is the time factor. On the basis if the methods take into account the time value of money or not, we distinguish (Wickham, 2006):

- **Static methods** - completely ignores the time factor and its effect on the value of money. Are characterized by simplicity and speed of calculation. They are used in cases, where the investment is made only for a short period and discount rate derived from the capital structure of the business is very small. Under these circumstances, abstracting from the time factor possible, but not entirely correct, since it can lead to bias and a wrong decision. Despite its deficiencies it can be used for the first preliminary calculations.

- **Dynamic methods** - take into account the exposure time factor and also partly the factor of risk. Both factors are reflected in the discount rate, which is used to update all input data. These methods should be used to evaluate investments

with longer useful economic life, guaranteeing that there is no significant bias in capital expenditures or cash income in time.

Another aspect for grading of the methods is the financial criteria (Collier, 2009):

- **Expense criteria** – the methods for which is the criteria the expected cost savings
- **Profit criteria** - the methods for which is the criteria the expected annual profit
- **criteria in the form of cash flow** - the evaluation criteria is the expected total cash flow from the investment project

The methods based on the cost criteria act as an economic effect of saving of the total cost. Methods with cost criteria are used mainly when we can't reliably predict the expected revenues from the investment.

Methods based on the profit criteria consider as an economic effect the profit after tax. It is certainly a more complex and sophisticated concept of the economic effect than cost methods, since profit includes the revenue from the performance of each variant of the investment projects. A major drawback of these methods is the concept of accounting profit which is not the total cash flow from investment, because doe's not include depreciation and possibly other cash flows arising from the implementation of the investment. Enterprise can use its depreciation policy to change significantly the amount of reported income and thus influence the view of the effectiveness of the investment (Valach, 2006) .

Due to these shortcomings in current theory and practice of evaluation of the investment projects, today is preferred the criterion based on the total cash flow of the investment. These methods are based on this criterion and respect the time value of money and are today considered the most appropriate for the evaluation of investment and also in practice are in the forefront in use (Valach, 2006).

6.8.1.1 Static methods

For purpose of these dissertation I will mention only one of the static methods, the **payback period**. It is a traditional method of evaluation, which is in practice often used,

particularly in the banking sector. Payback period is the number of years over which capital invested will be paid back by the cash incomes from the investment (Máče, 2006).

The formula for calculation according to Máče (2006):

$$I = \sum_{n=1}^{PT} P_n$$

I = capital outlay

PT = payback time in years

n =individual years of economic life

P_n = money income in the n-th year of economic life

Rule of this criterion is that the shorter payback period is the better is the project. Because the payback period reflects only time that is needed to cover capital expenditure by the cash income from investments, we cannot directly talk about the evaluation of economic efficiency of the project, but rather about the evaluation of the expected liquidity of the project. It means that if we choose from several options that have different lifetime and different flow of money income, then the investment that has a shorter lifetime is considered more liquid. This does not mean that it is also more effective, because after the repayment of capital expenditure is no longer counted cash flow until the end of the economic life of the project (Davies, 2001).

Another disadvantage of the method is non-compliance with the time factor. From the computational point of view, it is not difficult to discounting cash income each year and modify the basic pattern. From a static method, the method will be dynamic, which is often referred as the **discounted payback period** (Curwin, 2002).

Adjusted basic formula for calculation according to Curwin, (2002) is:

$$I = \sum_{n=1}^{PT} \frac{P_n}{(1+i)^n}$$

I, PT, n, Pn ... variables have the same meaning as in the basic formula

i…the discount rate

6.8.1.2 Dynamic Methods

Dynamic method aims to overcome the shortcomings of the static methods, in particular by the fact, that they automatically contain the influence of time factor and partly also the risk factor. Both factors are reflected in the discount rate, by which are updated all the input variables. Basic dynamic methods are **net present value** and its modification, **internal rate of return** and **economic value added** (Valach, 2006).

6.8.1.2.1 Net Present Value

NPV is a method that sees the economic effect of the investment the cash flow from the project. For respecting the time value of money is the basis of the method the sum of discounted net cash flows in different years of economic life of the investment project. In other words, the net present value can be defined as the difference between the discounted cash receipts from the project and the discounted capital expenditure of the project in each year (Valach, 2006).

The formula for calculation according to Valach, (2006) is:

$$NPV = \sum_{n=1}^{N} \frac{P_n}{(1+i)^{n+T}} - \sum_{t=0}^{T} \frac{K_t}{(1+i)^t}$$

NPV... Net Present Value

P_n ...money income in the n-th year

K_n ... Capital expenditure in the n-th year

t... individual years the investment in service

T ... total time of the investment operation

i ... the discount rate (required return)

N ... economic live in years

n ... particular year of the investment in service

The main advantage of the net present value is that the absolute number, indicates how much money will the company gain over the amount invested, i. e. how much will increase the total value of the company. Net present value of the right shows how the absolute contribution brings investments to the main business goals, namely to maximize the market value of the company (Valach, 2006).

Interpretation of possible outcomes for the net present value is as follows (Valach, 2006):

- NPV> 0 (discounted cash receipts are greater than the capital expenditure), then the investment project for the company is acceptable and enhancing the market value of the company

- NPV <0 (discounted cash receipts are less than capital expenditure)in this case is the investment project for the company unacceptable because its implementation would reduce market value of the company

- NPV = 0, then the investment project in terms of firm is indifferent (discounted cash receipts is equal to capital expenditure and the project does not increase or reduce the market value of company).

Among the weaknesses of the net present value is its high sensitivity to the discount rate (required return), while with increasing discount rate (ceteris paribus) decreases absolute contribution that investment brings. In economies with a turbulent environment the discount rate may vary during the different years, and therefore it is very difficult to predict (Broadbent, 1997) .

In the theory we can also find the **adjusted net present value**. This is modification of the basic method, the purpose is to take into account the financial consequences resulting from the decision how to finance the investment project. Among the financial implications of the project can be counted the cost associated with the issuance of bonds, grants from different funds or the interest tax shield (Valach, 2006).

The formula for calculation according to Valach, (2006) is:

$$NPV_U = NPV \pm F$$

NPV_U ... adjusted net present value

NPV ... net present value of the project

F ... the summary of the current values of all the financial implications of the project

6.8.1.2.2 Internal rate of return

Internal rate of return can be defined as the interest rate at which the current value of all cash receipts for the useful economic life of the project is equal to the present value of all capital expenditure for the project. In other words, it is an interest rate at which is the NPV of the project equal to zero (Valach, 2006).

The basic formula for calculation according to Valach, (2006) is:

$$\sum_{n=1}^{N} \frac{P_n}{(1+i)^{n+T}} = \sum_{t=0}^{T} \frac{K_t}{(1+i)^t}$$

i ... internal rate of return (unknown variable)

N, T, P_n, K_t, n, t ... variables have the same meaning as in the equation of NPV

The criterion for the selection of the investment project is the fact whether the internal rate of return percentage is greater than the required minimum return on investment, which is derived either from returns achieved on the capital market or the average cost of capital. When you compare more than one project, then is taken as the preferable one that which has a higher internal rate of return percentage (Broadbent, 1997).

The IRR we count from a positive value of NPV and a negative value. The values depend on the discount rate, we have to use different discount rates in order to find a positive and a negative value (Valach, 2006).

When we find these values, then we continue according following formula (Valach, 2006):

$$IRR = i_l + \frac{NPV_l}{NPV_l + NPV_h}(i_h - i_l)$$

i_l...lower discount rate

NPV_l...NPV with lower discount rate

NPV_h...NPV with higher discount rate (absolute value)

I_h...higher discount rate

6.8.1.2.3 Economic Value Added

Economic value added is the economic profit, which the firm creates after paying all the costs of total capital (Pavelková & Knápková, 2005).

The formula for calculation according to Pavelková & Knápková (2005):

$$EVA_{dis} = \sum_{n=1}^{N} \frac{EBIT_n * (1-t) - WACC * C_n}{(1+i)^n}$$

EVA_{dis} ... total value of the investment project according to indicator EVA

t ...tax rate

$EBIT_n$ ... earnings before interest and taxes in the n-th year

i... the discount rate

C_n ... the book value of the investment at the beginning of the n-th year

N ... economic lifetime

n... individual years of the investment in service

WACC ... weighted average costs of capital (see part cost of capital)

If the enterprise in a specific investment receives discounted positive economic value, it increases the wealth of its owners, given that the firm appreciates the capital more than is its cost, and it is therefore appropriate to adopt the investment. If is EVA_{dis} negative, then the investment is not beneficial for the owners and should be rejected (Pavelková & Knápková, 2005).

7 Cost of capital

Because an investment means greater cash outlay over a longer period of time, then we should in this context understand financial decisions as a specific proposal of funding long-term capital, by which is the investment project financed. This solution should be financially stable over time and should be optimal in terms of cost of the sources (we should seek the lowest average cost of additional capital for investment).

The cost of capital is defined as an expense which a company must pay to capital used to finance new investments. It is expressed a percentage of the value of capital investors, and often used the term ”price of capital” (Pavelková & Knápková, 2005) .

7.1 The cost of credit

This costs can be usually found out very easily, if we know the text of the credit agreement, we can identify the interest expense that the enterprise has to pay. In practice, there are fixed interest rate, but also variable. With variable rates is determining the cost more difficult and we need to know at least the forecast macroeconomic variables (such as future trends in inflation and GDP growth). From these data we can predict the development of variable interest over time.

From the tax perspective, the cost of the loan is tax deductible, and therefore reduces profit before tax. This fact should be taken into account when calculating the cost of credit (Pavelková & Knápková, 2005).

The formula for the cost of credit is(Pavelková & Knápková, 2005):

$$N_d = i * (1 - d)$$

i ... interest on the loan in %

N_d ... the cost of credit in %

d ... tax rate (tax rate of profit in %)

7.2 Average capital cost

The average cost of capital is defined as the average expenditure by a company must pay to obtain the capital. Often, the average cost of capital referred to as a weighted average cost of capital (WACC).

Calculating WACC depends on:

- the cost of each type of capital
- the proportion of each type of capital in total capital

The formula according to Mařík, et al., (2007) is:

$$WACC = N_d * \frac{CK}{K} + N_{VK} * \frac{VK}{K}$$

VK ... own capital in CZK

K... The total capital of firm in CZK (K = CK + VK)

WACC... the weighted average cost of capital

N_d ... cost of foreign capital in%

CK ... foreign capital in CZK

N_{VK} ... cost of own capital in %

The costs of own were until recent times in the Czech Republic considered as zero. Many companies behave as if capital was free, though capital costs are determined by the yield expectations of investors.

7.3 Cost of own capital

Determining the weighted average cost of capital is in the Czech Republic very difficult. Derivation of the cost of own capital is based on data that are easy to identify only for firms listed on stock exchanges. Moreover, relevant data is only of those companies that pay dividends and have a sufficient volume of shares traded. For other companies, which are not publicly traded and paid dividends to its shareholders, it is necessary to estimate the cost of equity capital under CAPM or provide subjective risk that shareholders bear and compare it with similarly-risk investments and the income required (Mařík, et al., 2007).

The basic formula for calculating the CAPM as follows (Valach, 2006):

$$r_e = r_f + \beta_{debt} * (r_m - r_f)$$

$$\beta_{debt} = \beta * [1 + (1 - tax\ rate) * External\ resources / total\ liabilities]$$

r_m ... *average revenue of the capital market*

r_e... *cost of own capital in%*

β... *factor beta of a company without debts*

β_{debt} ...*factor beta - including debts*

$(r_m - r_f)$ ... *capital market risk premium of the country*

r_f ... *risk-free interest rate*

Variable β_{debt} is adjusted beta factor to take in account the real debt of a company, while β is the standard referred beta factor for the company unencumbered. The average return of the stock market usually agrees with the average return on the main stock market index of the country. In the Czech Republic we can use the stock index PX (Mařík, et al., 2007).

CONCEPTUAL PART

8 Photovoltaic

The photovoltaic alternative way to produce electricity has a relatively small proportion (in terms of percentage of energy produced), but it found a large number of supporters and is experiencing a big boom. Since 1998 the photovoltaic market is growing annually by more than 35% and this is considered one of the fastest growing industries of the world (Klimek, 2007).

8.1 Sunshine conditions

The Czech Republic has relatively good conditions for using solar energy. The total duration of sunshine in the conditions of the CR ranges from 1400 - 1700 hours/year. In some areas, such as in the southern Moravia, the period of sunshine is even up to 2000 hours/year. The area of one square meter receives per year on average about 1100 kWh of energy. Approximately 75% of it is in the period from April to October and 25% for the remainder of the year. The intensity of the sunshine at noon, is for cloudy days 40-200W/m^2. On clear days, then 600-1000W/m^2 (Klimek, 2007).

Table 1 Performance of the solar energy at various conditions

	Sunshine (W/m^2)
Blue Sky	800-1000
Hazy sky	600-900
Hazy autumn day	100-300
Gloomy winter day	50
Year-round average	600

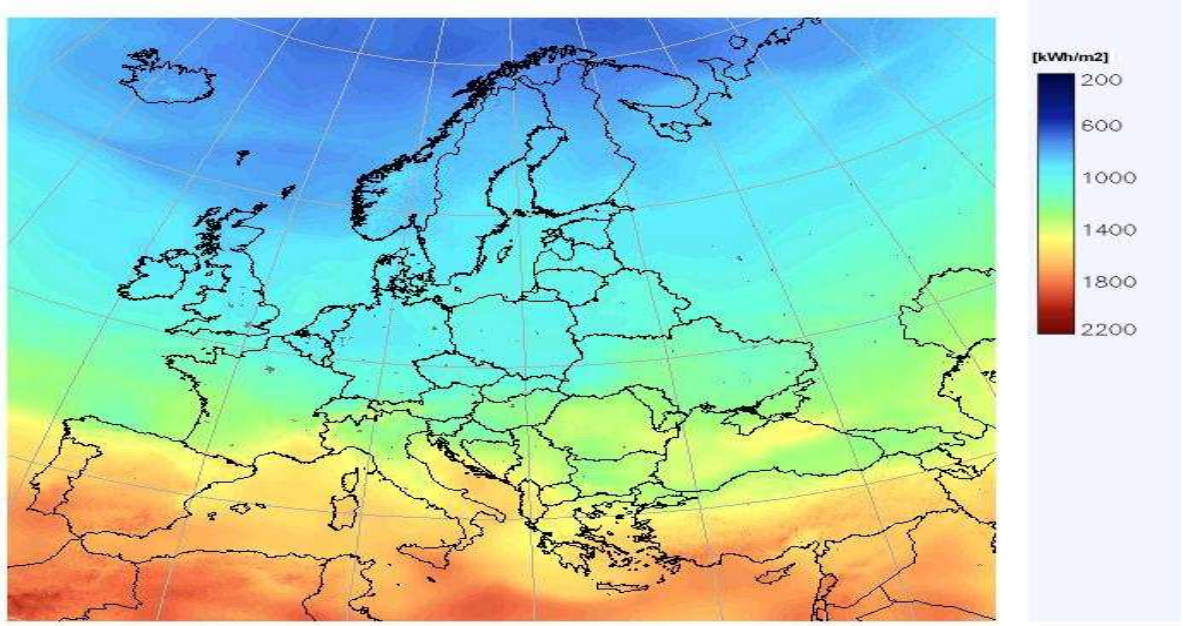
Source: Solar net s.r.o., 2009

Table 2 Sunshine in the Brno region

Month	Wh/m²/day
Jan	1247
Feb	2111
Mar	3163
Apr	4262
May	4953
Jun	4877
Jul	5211
Aug	4774
Sep	3679
Oct	2918
Nov	1309
Dec	872
Year	3288

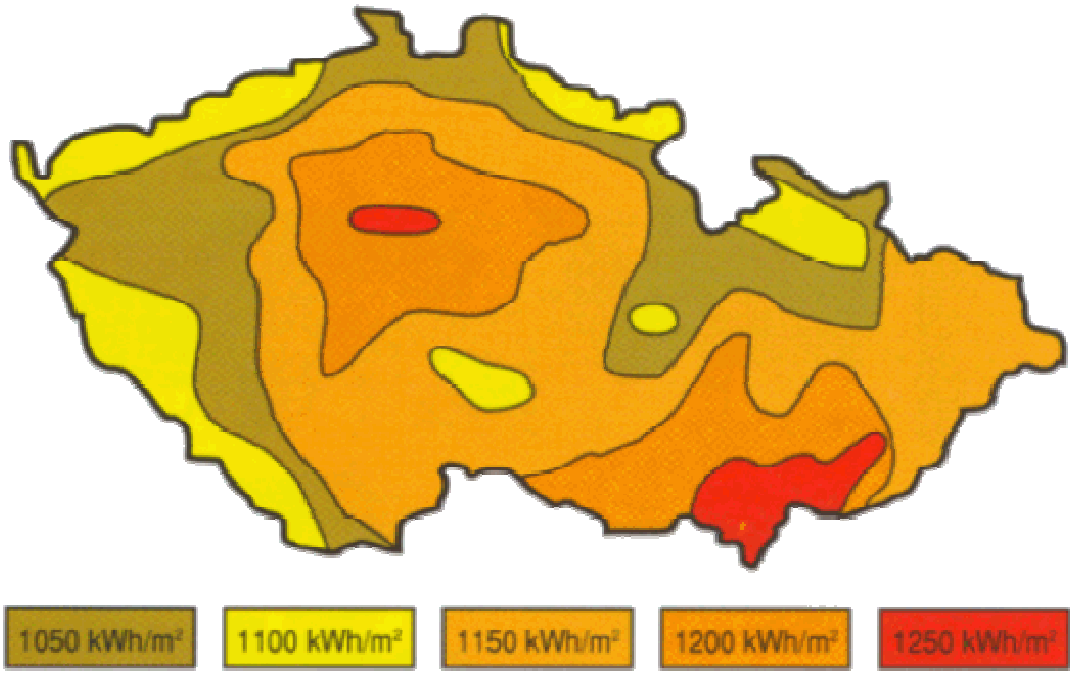
Source: PVGIS, 2009

Picture 3 The average amount of sunshine in Europe per year



Source: Sluneční záření v Evropě, 2009

Picture 4 The average amount of sunshine in the territory of the Czech republic



Source: Solar net s.r.o., 2009

9 Construction process of the photovoltaic power plant

Generally, the construction of electricity generating very complex process, it will be useful to have it separated into several stages (Knická, 2008.):

- **Business Plan.** To be able to start the construction of a power plant, it is first necessary to prepare a business plan. Its most important part should be the selection of suitable area.

- **The possibility of construction in the selected location**. Here, an investor may encounter a case where the land development plan counts with industrial construction or not (which is actually much likely). In the latter case, the investor needs to propose an amendment of the development plan.

- **Connection request.** Another necessity in the order that must be ensured before the application for building permit is finding ways and means to connect to the energy distribution network. The actual connection is agreed after the application, upon which is made a study on the connectivity of the source. If the results are positive and there are no technical obstacles that would prevent the connection, the distributor is obliged to realise the connection.

- **Securing the financial means**

- **Preparation of the project documentation**

- **Building control.** Decision on the placement of the building is issued on application to the Building Office, which asks for the consent of the environmental protection authority.

- **Licence application.** To be able to do business in the energy industry, there is required a licence granted by the Energy Regulation Authority

10 PEST analysis

PEST analysis is a method of interpreting the changing factors within an organisation external environment by categorising them into political, economic, social and technological influences (Kotler, 1999).

10.1 Political factors

Political influence in this industry is very important, as the market price of 1 kWh for the final consumer is something more than 5 CZK, and the price at which the owner of the transmission grid is obliged to buy the electricity from renewable sources is 12,79 CZK. When entering the EU, the Czech republic agreed that by 2010 8% of electricity production would be of "green" sources (Štětka, 2008). EU plans to have installed 100 million of m^2 of the photovoltaic power plants by 2010 (Habjanec, 2008). But this can change by a decision in Brussels, we can be never sure in the environment of EU.

10.2 Economical factors

The most significant economical factors are closely connected with the political. The law provides two basic types of support (Kloz, et al., 2007):

- Green bonus
- Compulsory purchase at a fixed price

Another type of support is the immunity of the income tax in the year when the photovoltaic power plant starts working and following five years (Knická, 2008.).

10.2.1 Green bonus

Green bonus is a supplement to the market price of electricity. Green bonus is determined in advance for the calendar year, and is calculated on the basis of the expected average level of price on the market. The recipient of the bonus is a producer of green electricity from renewable sources. They sell their electricity on the electricity market and receive the premium from the owner of the distribution system in the form of green bonus (Kloz, et al., 2007).

For the year 2009 is the value of the green bonus 11,81 CZK/kWh (excluding VAT) for photovoltaic power plants over 30 kW (Fiřt, 2008).

10.2.2 Compulsory purchase for a fixed price

The second system of support is the compulsory purchase for a fixed price. The transmission grid owners are obliged under the law and at specified conditions and at specified prices to purchase all electricity from renewable sources and make a contract, if a producer of electricity from renewable sources asks. This gives to the manufacturer a guarantee that all electricity produced will be sold paid for (Kloz, et al., 2007).

For the photovoltaic power plants that start production in the year 2009 is the price of compulsory purchase 12,79 CZK/kWh (excluding VAT) for photovoltaic power plants over 30 kW, guaranteed for 20 years (Fiřt, 2008). Yearly valorisation is 2-4 % depending on the industry price index (Vyhláška č. 150/2007 Sb.).

10.2.3 Decreasing prices of the technology

We can compare the costs of similar realized project, where is avalaible information; following table shows that the cost cost of 1 kWp of power is decreasing, probably due to new technologies and also the economic crisis:

Table 3 Decreasing prices of the technology

Photovoltaic power plant specific investment cost	Year	Power (kWp)	Cost (CZK / kWp)
Ostrožská Lhota	2006	702	128 000
Bušanovice #1	2007	668	141 600
Bušanovice #2	2008	693	115 269
Litoměřice	2008	1000	109 655
ABC Ltd.	2009	998	104 000

Source: author, based on Solární liga ČR, 2009, Korowatt, 2009, Zouhar, 2008 and company information.

10.3 Social factors

There are no serious social issues, only some people say that the land should be used for agricultural activity instead of building photovoltaic power plants, but they don't get much voice.

10.4 Technical factors

The photovoltaic panels work on the principle of the photoelectric effect. The same basic building blocks-solar cells - it is possible to implement applications with little power (power of calculators) to power plants with capacities in Mw. Photovoltaic

panels produce DC electricity, which is proportional to the area of solar cells and the intensity of sunlight.

Currently, most solar cells made from crystalline silicon in the single crystal form, with effectiveness 14 to 17% or polycrystalline, with effect 12 to 15%. In laboratories have already been developed cells with efficiency up to 28%, the best commercial products have the efficiency of 20%. Cheaper cells based on amorphous silicon, the efficiency is 5 to 9% now subside (Henze & Hillebrand, 2002).

11 Introduction of the company

History of company CBA Ltd. dates back to 1990 when the company was founded by a single shareholder and started its activities in the market works and construction of engineering networks. Later added to its offer the construction of gas facilities, pipelines liner, domestic and industrial gas, regulating stations and gas boiler plants. During several years the company built pipelines in dozens of municipalities and cities, particularly in the south Moravian region, but also other places of our country and a number of boiler plants and other gas equipment.

In 2009 the company CBA Ltd. started considering of an investment in photovoltaic power plant of the power of 1 mWp. The intention to build a photovoltaic power plant was based on the detection of an opportunity for realization of an acceptable return and a guaranteed profit. For realization of the project was founded a daughter company, which we will call ABC Ltd. Its only business is creation and running of the photovoltaic power plant. All work required for regular maintenance, monitoring the area, etc. will be provided through outsourcing.

For this power plant was chosen a plot of land of 40 000 m^2, approximately 20 km south east of Brno, which the company will pay for 1 250 000 CZK. Afterwards it was managed to persuade local authorities to change the development plan to allow the building of the photovoltaic power plant.

The company is planning to use photovoltaic panels made by polycrystalline silicon technology.

11.1 Deadlines

- **Connection request**-was made and it was agreed that the connection will start working on 31. December 2009.

- **Building permission**- The Building Office has agreed with the construction of the photovoltaic power plant and on 7. September issued a building permission valid for one year.

- **Licence for production of electricity**-The company ABC Ltd. has been negotiating with the Energy Regulation Authority about the licence for

production of electricity and the licence is promised to be issued on 9. November 2009.

- **Financing**-the negotiation about the loan is finishing and the money is expected to be avalaible on 5. November 2009.

- **The construction process**- is supposed to begin on 12. October 2009, supposed to end on 15. December 2009, after that follows a trial period till 31. December 2009 and this date the power plant is supposed to start full production.

12 Identified risks of the investment project

- **The operational risk** – there is a risk that the power plant won't work as promised, that the panels won't last for guarantied 20 years, that the decrease in production will be worse than guarantied 20% in 20 years. For example if the panels stop working after 15 years than we will be losing the profit and will have to sue the supplier, which is actually quite difficult in the Czech republic and takes many years; we also don't have any guarantee that the company will exist after 15 years, because the Czech business environment is changing very quickly.

- **The investment risk** - There has been doom saying of some experts, which follows the monetary economic theory which says, that the more money in the economy, the bigger inflation, and we have been seeing additions of huge amounts of money worldwide. The initial investment is very high and in the case of growing inflation, we could lose the money, since the investment is not liquid and the revenue won't be enough to compensate inflation in tens of percents.

- **The financial risk** - prices guaranteed for 20 years is a big advantage, but also a weakness, which can bring troubles. The problem is the prediction of the development of the operating costs, which are depending on the market situation and inflation.

The risk of innovation and the market risk are not present in this case as the prices and the sale are guaranteed for 20 years and the owners of the transition grids are obliged to buy all output of any producer so there is no competition.

13 SWOT analysis

Table 4 SWOT analysis

Strenghts Guaranteed prices	**Weaknesess** Big initial investment
Opportunities Decreasing prices of the construction costs	**Threads** Difficult predictibility of long term conditions

Source: author

Prices are guaranteed for 20 years which is a big advantage, which brings nowadays many people into this business. But there is a problem of predicting the development of the operating costs, which are depending on the market situation and inflation.

There has been doom saying of some experts, which follows the monetary economic theory which says, that the more money in the economy, the bigger inflation, and we have been seeing additions of huge amounts of money worldwide.

The initial investment is very high and in the case of growing inflation, we could lose the money, since the prices of electricity will be valorised by no more than 4%, the investment is not liquid and the revenue won't be enough to compensate growing operating costs in case of high inflation.

Big opportunity is the decrease of construction prices, and with the ongoing economic crisis has anybody with capital funds a big negotiating power, so the final price could be pressed down.

14 Expected costs

The cheapest offer of the construction, the company received counts with the following costs:

Table 5 Expected cost of construction

	Price per piece (CZK)	Quantity	Price (CZK)
Solar panel KD-210GH-2P	16 180	4752 pcs	76 887 360
El inverter. Current Fronius IG 500	498 820	22 pcs	10 974 040
Linking elektro - Solarkabel 6 mm ²	55 CZK/m	19000 m	1 045 000
Solid construction for FV Panel - Shletter	1 850	4752 pcs	8 791 200
Installation of rigid structures and PV panels	450	4752 kpl	2 138 400
Installation and integration converters el. Current IG	5 500	22 kpl	121 000
Electrical accessories (connectors MC, gutters,bushings, secondary switchboard, protection),estimated	1 200 000	1 kpl	1 200 000
Transport (PV panels, concrete footing,construction), est.	500 000	1 kpl	500 000
Construction material - estimate	790 000	1 kpl	790 000
Electrical protection grounded - estimate	1 090 000	1 kpl	1 090 000
Starting system - defining the limits of the el. parameters	140 000	1 kpl	140 000
NN electro project documentation (project elektro - implementation, design documentation FV, resources, technical report)	The price will be made after the expression of EON	estimation	114 000
Total price without VAT			103 791 000
Total price including VAT			123 511 290

Source: company information

Another initial cost that are not directly connected to the building of the power plant are following:

Table 6 Another initial costs

The plot of land	1 250 000
Fencing of the plot of land	850 000
Installation of electronic security field	970 000
Other costs in total	3 070 000

Source: company information

The yearly depreciation is according to the company following:

Table 7 Yearly depreciation

	yearly depreciation (CZK)		number of years
	first year	next years	
The power plant	1453074	3528894	30
The fence of the land	46750	89250	10
The electronic security field	106700	215825	5

Source: company information

Operating costs that the company is expecting are following:

Table 8 Operating costs

Operating costs	CZK
Purchase of electricity, fees	52 000
Monitoring equipment	320 000
Maintenance and security guarding	350 000
Insurance	1 000 000
Business executives	300 000
Other costs	310 000
Total	2 332 000

Source: company information

14.1 Cost of capital

The company follows the conservative long term financing strategy. The project will be financed from 20% by own capital and from the remaining 80% by bank loan. The lowest interest rate offered is 7% p.a. fixed for all ten years of repayment, which will be made yearly, starting in 2010. The total investment cost is 106 861 000 CZK, then the loan will be 85 488 800 CZK. The payments we can see in the following table:

Table 9 Repayments of the bank loan

year	interest (CZK)	repayment (CZK)	total payment (CZK)	debt left (CZK)
2010	5 984 216	8 548 880	14 533 096	76 939 920
2011	5 385 794	8 548 880	13 934 674	68 391 040
2012	4 787 373	8 548 880	13 336 253	59 842 160
2013	4 188 951	8 548 880	12 737 831	51 293 280
2014	3 590 530	8 548 880	12 139 410	42 744 400
2015	2 992 108	8 548 880	11 540 988	34 195 520
2016	2 393 686	8 548 880	10 942 566	25 646 640
2017	1 795 265	8 548 880	10 344 145	17 097 760
2018	1 196 843	8 548 880	9 745 723	8 548 880
2019	598 422	8 548 880	9 147 302	0

Source: company information

15 Expected revenues

The company ABC Ltd. was submitted following calculation by the company with the best offer:

Table 10 Calculation of the company with the best offer

Program - Full buyout		
Performance Power	998	kWp
Purchase price	12,79	CZK/kWh
Annual production	1 019 176	kWh/year
Estimated annual yield (purchase price x Annual production FVE)	13 035 261	CZK
Total investment cost	103 791 000	CZK
Expected return on investment - full buyout	8	years

Source: company information

I will try to show, that this calculation is very misleading by its simplicity, there is not included any operating cost and it doesn't reflect the time factor.

According to the calculation of the cheapest company offering to build the photovoltaic power plant, there is expected following production:

Table 11 Expected production according to the company with the best offer

Month	Production per day (kWh)	Production per month (kWh)
Jan	1100	34098
Feb	1851	51815
Mar	2756	85434
Apr	3651	109541
May	4199	130174
Jun	4113	123381
Jul	4355	135016
Aug	3961	122800
Sep	3085	92552
Oct	2470	76580
Nov	1134	34008
Dec	767	23778
Total annual production (kWh / year)		1019177

Source: company information

This kind of business is possible only thank to the European Union, which supports the renewable sources of electricity and employs many qualified experts in this field. According to its official portal of where can be found detailed information about the expected production, for any place in Europe, the expected production is following:

Table 12 Expected production according to the European Union

Month	Production per day (kWh)	Production per month (kWh)
Jan	978	30309
Feb	1607	44984
Mar	2436	75528
Apr	3271	98122
May	3754	116377
Jun	3670	110114
Jul	3896	120771
Aug	3544	109852
Sep	2737	82108
Oct	2152	66717
Nov	997	29900
Dec	685	21233
Total annual production (kWh / year)		906015

Source: PVGIS, 2009

For the calculation was used the data sourced by the company with the best offer, which is following:

- Nominal power of the power plant : 998 kWp (technology polycrystalline silicon)
- Slope of the modules: 35.0 °
- Orientation (azimuth) modules: 0.0 ° (South)
- Estimated loses due to temperature: 6.8% (using a database of temperature)
- Estimated loses due to angle of reflection: 3.0%
- Other loses (cables, converters, etc.): 6.2%
- Total system loses: 16.0%

Since the price of the **green bonus** is guaranteed only for one year and the **compulsory purchase for a fixed price** is guaranteed for 20 years, the company has chosen to use this option. Then we can calculate the expected income:

Table 13 Expected revenue

	Production per yar (kWh)	Price (CZK/kWh)	Revenue per year (CZK)
Production according to the EU calculation	906015	12,79	11 587 932
Production according to the company with the best offer	1019177	12,79	13 035 274

Source: author, based on company information and PVGIS, 2009

Even though that there will still be some book value of the property at the end of economic life time, it is unpredictable what will be the market value, then I neglect the liquidation of the project.

16 Cost and revenues analysis

For evaluation of the project, I will use three variants of development of the circumstances influencing the economical success of the project, a most probably variant, a positive variant and a negative variant:

A. **The most probably variant**-the rise of industry price index will be 3,97% yearly, the discount rate will be 4,65 percent. The corporate tax rate will be 24 percent in the first year growing annually by one percent. The valorisation of the electricity price will be 3,97% yearly. The decrease of the output of the panels will be continuous to 20% after 20[2] years. The revenue will be arithmetic average of the production according to the EU and according to the company with the best offer[3].

B. **The positive variant**- the rise of industry price index will be 2,1% yearly, the discount rate will be 2,46 percent. The corporate tax rate will be 24 percent for whole period. The valorisation of the electricity price will be 2,1% yearly. The decrease of the output of the panels will be continuous to 10% after 20 years. The production will be according to company with the best offer.

C. **The negative variant**- the rise of industry price index will be 7,54% yearly[4] , the discount rate will be 8,84 percent. The corporate tax rate will be 24 percent in the first year growing annually by two percent. The valorisation of the electricity price will be 4% yearly. The decrease of the output of the panels will be continuous to 40%[5] after 20 years. The production will be according to the EU.

[2] The life time of the project is supposed to be 20 years, even though that the life time of the power plant guaranteed for 20 years, but is claimed to be 30 to 35 years, because for 20 years is guaranteed the price of the buyout of the electricity produced. After that there will probably be a new policy which is unpredictable.

[3] The EU employs many experts in this field, on the other hand they offer calculation for any point in Europe, which can't be the most accurate. The company has motivation to promise good revenues in order to get the order of building this power plant, but also the local knowledge.

[4] According to the monetary economical theory, the input of the money into economy as it has been happening now, will cause inflation.

[5] We can trust the company information about the life time and guarantied decrease if we are naive, but with the experience of Czech business environment the company can go bankrupt quite earlier than we manage to sue our rights.

The expected rise in the industry price index was calculated for variant A as geometric 15% average of its changes during 16 years period of existence of the Czech republic. For variant B was this number multiplied by coefficient 0,53 and for variant C by coefficient 1,9 because one group of experts predict another fall in prices due to the economical crisis whereas second group expects high inflation due to expansive monetary policy (Lacina, 2008.).

Table 14 Changes of industry price index

1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
9,2	5,3	7,6	4,8	4,9	4,9	1	4,9	2,9	-0,5	-0,3	5,7	3	1,6	4,1	4,5

Source: Businessinfo, 2009

In October 2009 the yield of long term bonds of the Czech Republic with time expiration on 9th December 2022 were fixed on 4,86% for purchase and 4,65% for sale(Patria, 2009). For the assessment of discount rate for variant A is used as the risk free rate the yield for sale, 4,65% p.a.

For the variant B we use lower interest rate, which is the interest rate of variant A multiplied by same index as the rise of industry price index, since we can expect lower required profits with lower inflation and in the variant C vice versa.

In all variants the operating costs rise according to the industry price index.

The corporate tax rate is currently 20% but there have been talk about increasing it, due to the economic crisis with the need of funding the state budget, serious suggestions are 24%. We can expect, that the socialist opposition party will win the elections in the Spring and then the taxes will start rising (Horáček, 2009). With the size of budget deficit and state debt, there will probably be continuous rise in tax rates[6]. Nevertheless because the revenues from the renewable sources of energy are not taxable in the first five years, we start count taxation after this period.

The variants will be evaluated by **Payback period**, **Net Present Value**, **Internal Rate of Return**, **Economic Added Value**

In the following tables we can see expected prices of electricity, output, revenue, compounded operating costs, tax rate and cash flow for each variant:

[6] 15 years ago was the corporate tax rate 40%

Table 15 Variant A

year	price of electricity (CZK/kWh)	output (kWh)	revenue (CZK)	compounded operating costs (CZK)	Tax rate (%)	cash flow (CZK)
2010	13,30	952 970	12 674 502	2 424 580	0	10 249 921
2011	13,83	943 344	13 048 335	2 520 836	0	10 527 499
2012	14,39	933 718	13 431 797	2 620 913	0	10 810 883
2013	14,96	924 092	13 825 057	2 724 964	0	11 100 094
2014	15,56	914 466	14 228 288	2 833 145	0	11 395 144
2015	16,18	904 840	14 641 658	2 945 621	29	9 353 448
2016	16,83	895 214	15 065 331	3 062 562	30	9 487 382
2017	17,50	885 588	15 499 472	3 184 145	31	9 619 200
2018	18,20	875 962	15 944 239	3 310 556	32	9 748 711
2019	18,93	866 336	16 399 789	3 441 985	33	9 875 716
2020	19,69	856 710	16 866 272	3 578 632	34	9 969 666
2021	20,47	847 084	17 343 834	3 720 704	35	10 090 147
2022	21,29	837 459	17 832 614	3 868 416	36	10 207 489
2023	22,15	827 833	18 332 747	4 021 992	37	10 321 467
2024	23,03	818 207	18 844 359	4 181 665	38	10 431 850
2025	23,95	808 581	19 367 567	4 347 677	39	10 538 402
2026	24,91	798 955	19 902 481	4 520 280	40	10 640 878
2027	25,91	789 329	20 449 200	4 699 735	41	10 739 031
2028	26,94	779 703	21 007 812	4 886 314	42	10 832 604
2029	28,02	770 077	21 578 394	5 080 301	43	10 921 338
Total		17 230 468	336 283 747	71 975 021		206 860 870

Source: author, based on company information and PVGIS, 2009

Table 16 Variant B

year	price of electricity (CZK/kWh)	output (kWh)	revenue (CZK)	compounded operating costs (CZK)	Tax rate (%)	cash flow (CZK)
2010	13,05	1 014 081	13 229 499	2 380 972	0	10 848 527
2011	13,31	1 008 985	13 426 280	2 430 972	0	10 995 307
2012	13,57	1 003 889	13 625 640	2 482 023	0	11 143 617
2013	13,84	998 793	13 827 604	2 534 145	0	11 293 458
2014	14,12	993 698	14 032 196	2 587 362	0	11 444 833
2015	14,40	988 602	14 239 440	2 641 697	24	9 682 640
2016	14,69	983 506	14 449 362	2 697 173	24	9 800 019
2017	14,99	978 410	14 661 985	2 753 813	24	9 918 565
2018	15,29	973 314	14 877 333	2 811 643	24	10 038 279
2019	15,59	968 218	15 095 430	2 870 688	24	10 159 158
2020	15,90	963 122	15 316 300	2 930 972	24	10 259 783
2021	16,22	958 026	15 539 966	2 992 523	24	10 382 992
2022	16,55	952 930	15 766 453	3 055 366	24	10 507 361
2023	16,88	947 835	15 995 783	3 119 528	24	10 632 888
2024	17,21	942 739	16 227 980	3 185 038	24	10 759 570
2025	17,56	937 643	16 463 067	3 251 924	24	10 887 403
2026	17,91	932 547	16 701 065	3 320 215	24	11 016 381
2027	18,27	927 451	16 941 999	3 389 939	24	11 146 500
2028	18,63	922 355	17 185 889	3 461 128	24	11 277 753
2029	19,01	917 259	17 432 758	3 533 812	24	11 410 134
Total		19 313 404	305 036 028	58 430 934		213 605 169

Source: author, based on company information and PVGIS, 2009

Table 17 Variant C

year	price of electricity (CZK/kWh)	output (kWh)	revenue (CZK)	compounded operating costs (CZK)	Tax rate (%)	cash flow (CZK)
2010	13,30	887 895	11 809 000	2 538 149	0	9 270 851
2011	13,83	869 774	12 030 720	2 762 521	0	9 268 198
2012	14,39	851 654	12 251 283	3 006 728	0	9 244 555
2013	14,96	833 534	12 470 242	3 272 523	0	9 197 719
2014	15,56	815 414	12 687 116	3 561 814	0	9 125 302
2015	16,18	797 293	12 901 387	3 876 678	29	7 456 805
2016	16,83	779 173	13 112 500	4 219 376	30	7 310 630
2017	17,50	761 053	13 319 861	4 592 369	31	7 143 594
2018	18,20	742 932	13 522 830	4 998 335	32	6 954 463
2019	18,93	724 812	13 720 725	5 440 188	33	6 741 948
2020	19,69	706 692	13 912 815	5 921 100	34	6 474 356
2021	20,47	688 571	14 098 320	6 444 525	35	6 210 079
2022	21,29	670 451	14 276 404	7 014 222	36	5 918 198
2023	22,15	652 331	14 446 177	7 634 279	37	5 597 187
2024	23,03	634 211	14 606 690	8 309 149	38	5 245 455
2025	23,95	616 090	14 756 930	9 043 678	39	4 861 353
2026	24,91	597 970	14 895 819	9 843 139	40	4 443 166
2027	25,91	579 850	15 022 208	10 713 272	41	3 989 119
2028	26,94	561 729	15 134 875	11 660 326	42	3 474 549
2029	28,02	543 609	15 232 519	12 691 098	43	2 541 421
Total		14 315 037	274 208 420	127 543 468		130 468 947

Source: author, based on company information and PVGIS, 2009

16.1 Payback period

The payback period of each variant is following:

Table 18 Payback period

The variant	Payback period (years)
A	11
B	11
C	15

Source: author, based on company information and PVGIS, 2009

As we can see, if we use a static method which doesn't include the time factor, there is not a difference between the variants A and B, the payback period of variant C is four years more.

If we use the discounted payback period, which includes the time factor, then the numbers change in the following way:

Table 19 Discounted payback period

The variant	Discount rate (%)	Payback period (years)
A	4,65	15
B	2,46	12
C	8,84	never

Source: author, based on company information and PVGIS, 2009

The variant A of development of the circumstances have payback period three years more, the payback time of the variant B is one year more, the variant C will never get paid back.

16.2 Net Present Value

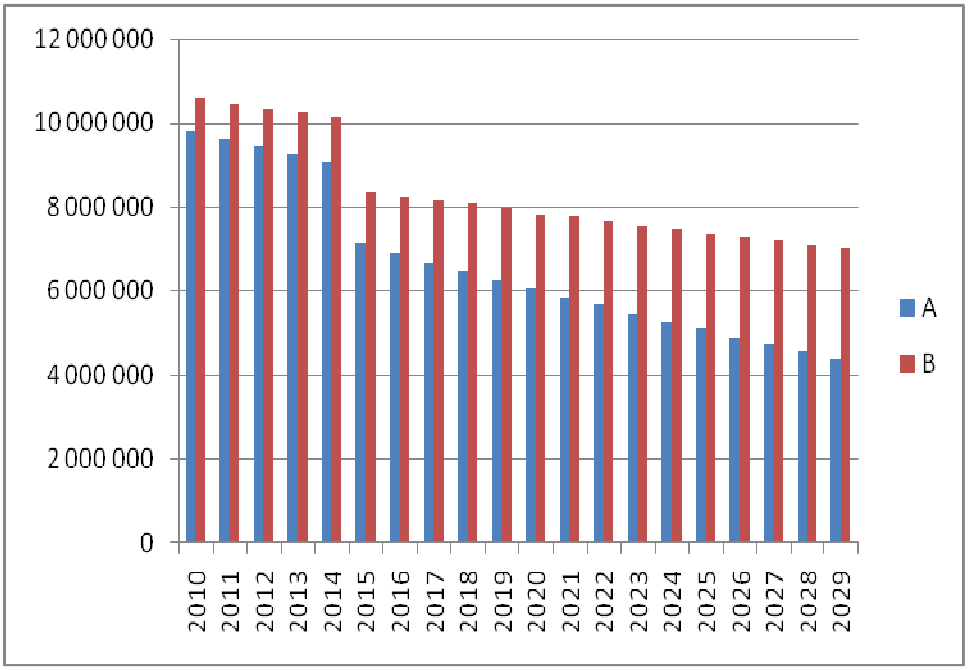
Table 20 NPV

Discounted cash flow (CZK)			
	A	B	C
2010	9 794 478	10 588 061	8 517 871
2011	9 612 730	10 473 665	7 823 809
2012	9 432 862	10 360 080	7 170 020
2013	9 254 857	10 247 302	6 554 295
2014	9 078 699	10 135 326	5 974 541
2015	7 120 924	8 368 886	4 485 611
2016	6 901 949	8 266 971	4 040 500
2017	6 686 904	8 166 088	3 627 509
2018	6 475 810	8 066 220	3 244 642
2019	6 268 682	7 967 356	2 890 015
2020	6 047 127	7 853 086	2 549 897
2021	5 848 261	7 756 580	2 247 164
2022	5 653 389	7 661 029	1 967 608
2023	5 462 509	7 566 418	1 709 741
2024	5 275 612	7 472 736	1 472 161
2025	5 092 688	7 379 971	1 253 547
2026	4 913 721	7 288 111	1 052 658
2027	4 738 697	7 197 144	868 327
2028	4 567 594	7 107 059	694 890
2029	4 400 390	7 017 844	466 988
Total	132 627 882	166 939 933	68 611 795
Total investment cost			106861000
NPV	**25 766 882**	**60 078 933**	**-38 249 205**

Source: author, based on company information and PVGIS, 2009

After the calculation of NPV I can say, that the project is acceptable only in case of development of the variants A and B, but not in the case of the variant C, as in the case of the discounted payback period.

Graph 1 Discounted cash flow of variants A and B



Source: author, based on company information and PVGIS, 2009

The graph shows the discounted cash flow for the variants A and B.

16.2.1 Adjusted net present value

Table 21 Adjusted NPV

Variant	A	B	C
NPV	**25 766 882**	**60 078 933**	**-38 249 205**
Discounted interest of the loan (CZK)	27 608 693	29 916 664	6 005 057
Adjusted NPV (CZK)	-1 841 811	30 162 269	-44 254 261

Source: author, based on company information and PVGIS, 2009

As we can see in the table, when I included the interest paid for the loan, then the project is acceptable only for scenario B, which is the optimistic one.

16.3 Internal rate of return

The IRR we count from a positive value of NPV, in this case scenario A, and a negative value, in this case we can use C. The values depend on the discount rate, if all scenarios had positive value, than we would have to use higher discount rate in order to find one with negative value. Then we use the formula described in theoretical part.

The IRR for this project is 6,34% which is acceptable for variant A and B, where the discount rate is 4,65%, respectively 2,46%, but is not acceptable for any interest rate over it.

16.4 Economic Value Added

To calculate the economic value added we first have to know the cost of own and foreign capital. Total capital of the company is in 2009: 106 861 000 CZK, 85 488 800 of which is borrowed and 21 372 200 CZK is own capital.

Table 22 Capital structure in different years

year	Total capital (CZK)	Own capital (CZK)	Foreign capital (CZK)
2010	106 861 000	29 921 080	76 939 920
2011	106 861 000	38 469 960	68 391 040
2012	106 861 000	47 018 840	59 842 160
2013	106 861 000	55 567 720	51 293 280
2014	106 861 000	64 116 600	42 744 400
2015	106 861 000	72 665 480	34 195 520
2016	106 861 000	81 214 360	25 646 640
2017	106 861 000	89 763 240	17 097 760
2018	106 861 000	98 312 120	8 548 880
2019	106 861 000	106 861 000	0
2020	106 861 001	106 861 001	0
2021	106 861 002	106 861 002	0
2022	106 861 003	106 861 003	0
2023	106 861 004	106 861 004	0
2024	106 861 005	106 861 005	0
2025	106 861 006	106 861 006	0
2026	106 861 007	106 861 007	0
2027	106 861 008	106 861 008	0
2028	106 861 009	106 861 009	0
2029	106 861 010	106 861 010	0

Source: author, based on company information

16.4.1 Cost of foreign capital

The expenses of a loan are tax deductible. To count the cost of credit as mentioned before, we need to know the interest rate of the loan, which is in this case 7% and the tax rate. The cost of credit in each year of economic life for each variant we can see in the following table:

Table 23 Cost of foreign capital in each year of economic life for each variant (%)

Year	A	B	C
2010	7	7	7
2011	7	7	7
2012	7	7	7
2013	7	7	7
2014	7	7	7
2015	4,97	5,32	4,62
2016	4,9	5,32	4,48
2017	4,83	5,32	4,34
2018	4,76	5,32	4,2
2019	4,69	5,32	4,06
2020	4,62	5,32	3,92
2021	4,55	5,32	3,78
2022	4,48	5,32	3,64
2023	4,41	5,32	3,5
2024	4,34	5,32	3,36
2025	4,27	5,32	3,22
2026	4,2	5,32	3,08
2027	4,13	5,32	2,94
2028	4,06	5,32	2,8
2029	3,99	5,32	2,66

Source: author, based on company information

16.4.2 Cost of own capital

We will calculate the cost of own capital with help of CAMP model. Average revenue of the capital market is 6.24% (Patria, 2009), risk-free interest rate is 4,65% for variant A, 2,46% for variant B and 8,84% for variant C. Factor beta of company ABC Ltd., which belongs to “Independent Power Producers and Energy Traders” industry on emerging markets is 0,71 (Amodar, 2009), for company without debts.

Table 24 Cost of own capital in each year of economic life for each variant (%)

Year	A	B	C
2010	6,91	7,83	5,15
2011	6,91	7,83	5,15
2012	6,91	7,83	5,15
2013	6,91	7,83	5,15
2014	6,91	7,83	5,15
2015	6,58	7,18	5,78
2016	6,57	7,18	5,81
2017	6,56	7,18	5,85
2018	6,55	7,18	5,89
2019	6,54	7,18	5,92
2020	6,52	7,18	5,96
2021	6,51	7,18	6,00
2022	6,50	7,18	6,03
2023	6,49	7,18	6,07
2024	6,48	7,18	6,11
2025	6,47	7,18	6,14
2026	6,46	7,18	6,18
2027	6,44	7,18	6,22
2028	6,43	7,18	6,26
2029	6,42	7,18	6,29

Source: author, based on company information

16.4.3 Average weighted cost of capital

When we know both, the cost of own and the cost of foreign capital, then we can calculate the average weighted cost of capital, which is following:

Table 25 Average weighted cost of capital in each year of economic life for each variant (%)

year	A	B	C
2010	6,97	7,23	6,48
2011	6,97	7,30	6,33
2012	6,96	7,36	6,19
2013	6,95	7,43	6,04
2014	6,94	7,50	5,89
2015	6,07	6,59	5,41
2016	6,17	6,74	5,49
2017	6,28	6,89	5,61
2018	6,40	7,03	5,75
2019	6,54	7,18	5,92
2020	6,52	7,18	5,96
2021	6,51	7,18	6,00
2022	6,50	7,18	6,03
2023	6,49	7,18	6,07
2024	6,48	7,18	6,11
2025	6,47	7,18	6,14
2026	6,46	7,18	6,18
2027	6,44	7,18	6,22
2028	6,43	7,18	6,26
2029	6,42	7,18	6,29

Source: author, based on company information

Then we can calculate the EVA, which is following:

Table 26 EVA for variant A

Year	Book value of assets	EBIT	Tax rate (%)	EVA
2010	105 254 476	8 735 978	0	1 333 337
2011	101 420 507	6 882 366	0	-167 469
2012	97 586 538	7 265 828	0	413 894
2013	93 752 569	7 659 088	0	951 623
2014	89 918 600	8 062 319	0	1 448 240
2015	86 300 456	8 691 514	29	713 184
2016	82 682 312	9 115 187	30	931 431
2017	79 064 168	9 549 328	31	1 128 047
2018	75 446 024	9 994 095	32	1 305 099
2019	71 827 880	10 449 645	33	1 464 462
2020	68 298 986	11 005 378	34	1 703 043
2021	64 770 092	11 482 940	35	1 881 176
2022	61 241 198	11 971 720	36	2 038 362
2023	57 712 304	12 471 853	37	2 176 055
2024	54 183 410	12 983 465	38	2 295 624
2025	50 654 516	13 506 673	39	2 398 360
2026	47 125 622	14 041 587	40	2 485 477
2027	43 596 728	14 588 306	41	2 558 118
2028	40 067 834	15 146 918	42	2 617 358
2029	36 538 940	15 717 500	43	2 664 210
Total		219 321 687		**32 339 629**

Source: author, based on company information

Table 27 EVA for variant B

Year	Book value of assets	EBIT	Tax rate (%)	EVA
2010	105 254 476	9 290 975	0	1 630 348
2011	101 420 507	7 260 311	0	-133 182
2012	97 586 538	7 459 671	0	250 069
2013	93 752 569	7 661 635	0	617 933
2014	89 918 600	7 866 227	0	970 801
2015	86 300 456	8 289 296	24	515 142
2016	82 682 312	8 499 218	24	723 422
2017	79 064 168	8 711 841	24	929 269
2018	75 446 024	8 927 189	24	1 132 367
2019	71 827 880	9 145 286	24	1 332 427
2020	68 298 986	9 455 406	24	1 647 019
2021	64 770 092	9 679 072	24	1 896 071
2022	61 241 198	9 905 559	24	2 130 677
2023	57 712 304	10 134 889	24	2 351 437
2024	54 183 410	10 367 086	24	2 558 928
2025	50 654 516	10 602 173	24	2 753 706
2026	47 125 622	10 840 171	24	2 936 306
2027	43 596 728	11 081 105	24	3 107 243
2028	40 067 834	11 324 995	24	3 267 014
2029	36 538 940	11 571 864	24	3 416 094
Total		188 073 968		**34 033 090**

Source: author, based on company information

Table 28 EVA for variant C

Year	Book value of assets	EBIT	Tax rate (%)	EVA
2010	105 254 476	7 870 476	0	873 725
2011	101 420 507	5 864 751	0	-387 843
2012	97 586 538	6 085 314	0	28 628
2013	93 752 569	6 304 273	0	310 797
2014	89 918 600	6 521 147	0	492 710
2015	86 300 456	6 951 243	34	-25 935
2016	82 682 312	7 162 356	36	11 827
2017	79 064 168	7 369 717	38	31 475
2018	75 446 024	7 572 686	40	39 603
2019	71 827 880	7 770 581	42	40 755
2020	68 298 986	8 051 921	44	58 989
2021	64 770 092	8 237 426	46	63 239
2022	61 241 198	8 415 510	48	63 623
2023	57 712 304	8 585 283	50	61 447
2024	54 183 410	8 745 796	52	57 669
2025	50 654 516	8 896 036	54	52 981
2026	47 125 622	9 034 925	56	47 876
2027	43 596 728	9 161 314	58	42 692
2028	40 067 834	9 273 981	60	37 658
2029	36 538 940	9 371 625	62	32 918
Total		157 246 360		**1 934 833**

Source: author, based on company information

Values of EVA are positive for every scenario of development. Each scenario brings value to the investor. There a small difference between variants A and B, only the variant C is more than fifteen times smaller, but still acceptable.

17 Conclusion

The industry of photovoltaic power plants is very appealing today to many people in the Czech republic, because the banks offer very low interests and this offers guarantied revenue for 20 years, this investment looks very safe. The promotion materials usually expect higher production than the EU, which supports these activities and have many experts calculating the expected production at various places in Europe. The promotion materials also usually don't mention a trap in the valorization of prices according to rise of industry price index, which is maximally 4%, even if the prices were rising by 10%.

With use of static methods, such as payback period that don't include operating costs and taxes, which are using the companies building these power plants for their promotion, the payback period looks very good.

Nevertheless when we include into calculation other costs such as cost of the place, where we build the power plant, its fencing, security system etc., operating cost and include inflation then the costs rise significantly.

In case of the company ABC Ltd. the payback period calculated by company, which submitted the best offer was 8 years. When I included cost of land, operating costs and corporate tax, it changed to 11 years for the most probably and the positive scenario of development of the environment, 15 years for negative scenario. When I used the discounted payback period, it appeared, that the most probably variant has payback period 15 years, the positive 12 and the negative won't be paid back within the period of 20 years, for which are guaranteed prices.

The NPV shows, that the investment is worthwhile only if happens the most probably or positive scenario, if we use the adjusted NPV, which includes implications of financing of the project, in this case the bank loan, then the value of NPV is positive only in the positive scenario, in the other two is negative.

The IRR for this project is 6,34% which is acceptable for the most probably and the positive variant, where the discount rate is 4,65%, respectively 2,46%, but is not acceptable for any interest rate over it. The negative scenario would make loss.

Values of EVA are positive for every scenario of development. There is a small difference between variants A and B, only the variant C is more than fifteen times smaller, but still acceptable.

Majority of used methods shows, that this investment project brings low, or no contribution. The adjusted NPV shows that the project brings profit only in the positive variant of development. The IRR is not even two percent higher than discount rate for long term government bonds.

I wouldn't recommend this investment project, as we can't expect neutral inflation, where rise prices on both sides, inputs and products. Here the price of our product can rise only up to 4% a year, whereas the rise of costs is not limited. This investment project follows the strategy of maximization of annual revenue, which can be applied only in an environment of low inflation, where the investment is not devalued (Máče, 2006).

18 Literature

Amodar, 2009. *Risk Premiums for Other Markets*, [Online]. Avalible at: http://pages.stern.nyu.edu/~adamodar/, [Accessed 8 October 2009].

Bammer, G., 2008. *Uncertainty and risk : multi-disciplinary perspectives.* London: Sterling.

Bazerman, M., H., 2002. *Judgment in managerial decision making*. New York: Wiley.

Broadbent, M., 1997. *Managing financial resources*. Oxford : Butterworth-Heinemann.

Businessinfo, 2009. *Hlavní makroekonomické ukazatele ČR*, [Online]. Avalible at: http://www.businessinfo.cz/cz/clanek/analyzy-statistiky/hlavni-makroekonomicke-ukazatele-cr/1000431/49089/#cenyprum, [Accessed 8 October 2009].

Collier, P., M., 2009. *Accounting for managers : interpreting accounting information for decision making.* Hoboken, N.J. : Wiley

Curwin, J., 2002. *Quantitative methods for business decisions.* London : Thomson Learning.

Davies, T., 2001. *Business accounting and finance*. London : McGraw-Hill.

Drury, C., 2008. *Management and cost accounting*. London : South-Western Cengage Learning.

Fiřt, J., 2008. *Cenové rozhodnutí Energetického regulačního úřadu č. 8/2008 ze dne 18. listopadu 2008, kterým se stanovuje podpora pro výrobu elektřiny z obnovitelných zdrojů energie, kombinované výroby elektřiny a tepla a druhotných energetických zdrojů.* [Online]. Avalible at: http://www.eru.cz/user_data/files/cenova%20rozhodnuti/CR%20elektro/OZ/CR_8-2008_OZE-KVET-DZ.pdf, [Accessed 4. October 2009].

Fotr, J., 2005. *Podnikatelský záměr a investiční rozhodování.* Praha: Grada.

Habjanec, D., 2008. *Sluneční energie.* [Online], (updated 26 September 2008). Available at: http://zdrojeenergie.blogspot.com/2008/09/slunecni-energie.html, [accessed 10 October 2009].

Henze , A., Hillebrand, W., 2002. *Elektrický proud ze Slunce*. Ostrava: HEL Ostrava.

Horáček, F., 2009. *ČSSD oprášila do voleb daně pro bohaté. Z platu by dali až 38 procent.* Dnes online, [internet] 17 June. Available at http://ekonomika.idnes.cz/cssd-oprasila-do-voleb-dane-pro-bohate-z-platu-by-dali-az-38-procent-pyq-/ekonomika.asp?c=A090617_142853_ekonomika_fih, [accessed 9 October 2009].

Jones, T., T., 2004. *Business economics and managerial decision making*. Chichester : John Wiley.

Kepner, Ch., H., 2006. *The new rational manager*. Princeton, N.J. : Princeton Research Press.

Klimek, P., 2007. *Sborník přednášek – seminář Využití solární energie*. Olomouc.

Kloz, M., et al., 2007. *Využívání obnovitelných zdrojů energie – Právní předpisy s komentářem.*Praha: Linde Praha.

Knická, M., 2008. *Právní úprava výroby elektrické energie z alternativních zdrojů*. Brno: Masarykova Univerzita.

Koráb, V., Peterka., J., Režňáková, M., 2007.*Podnikatelský plán*. Brno: Computer Press.

Korowatt, s.r.o., 2009. *Fotovoltaická elektrárna Bušanovice.* [Online]. Avalible at: http://korowatt.cz/reference.php#busanovice-2, [Accessed 5 October 2009].

Kotler, P., 1999. *Principles of marketing.* 8th ed. London: Prentice Hall International.

Lacina, J., 2008. *Deflace jako průvodní jev recesí. Mýtus nebo realita?* [Online]. Avalible at: http://www.euroekonom.cz/analyzy-clanky.php?type=jl-deflace2, [Accessed 14 October 2009].

Máče, M., 2006. *Finanční analýza investičních projektů*. Praha : Grada.

Mařík, M., et al., 2007. *Metody oceňování podniku*. Ekopress.

Patria, 2009. [Online]. Avalible at: http://www.patria.cz/zpravodajstvi/home.html, [Accessed 8. October 2009].

Pavelková, D., Knápková, A., 2005. *Výkonnost podniku z pohledu finančního manažera*. Linde nakladatelství.

PVGIS, 2009. *Solar Irradiation Data*. [Online]. Avalible at: http://re.jrc.ec.europa.eu/pvgis/apps/radmonth.php?lang=en&map=europe, [Accessed 2. October 2009].

Sluneční záření v Evropě, 2009. [Online]. Avalible at: http://www.nazeleno.cz/Files/FckGallery/solar1.zip/graf.jpg, [Accessed 2. October 2009].

Solar net s.r.o., 2009. *Seriál o solární energii a zařízeních* .[Online]. Avalible at: http://www.solarnet.cz/Solarni_serial.htm, [Accessed 2. October 2009].

Solární liga ČR, 2009. *Největší fotovoltaické elektrárny v České republice II*. [Online]. Avalible at: http://www.solarniliga.cz/mats02.html, [Accessed 5. October 2009].

Štětka, J., 2008. *Tlačenice na větrné mapě.* Ekonom online, [internet] 7 May. Avalaible at: http://ekonom.ihned.cz/index.php, [accessed 10. October 2009].

Struck, U., 1992. *Přesvědčivý podnikatelský plán.* Praha : Management Press.

Synek, M. et al., 2006. *Podniková ekonomika*. 4. přeprac. vyd. Praha: C. H. Beck.

Toffler, A., Toflerová, H., 2001. *Nová civilizace: třetí vlna a její důsledky*. Praha: Nakladatelství Dokořán.

Valach, J. et al., 1999 : *Finanční řízení a rozhodování podniku*. Praha, Ekopress.

Valach, J., 2006. *Investiční rozhodování a dlouhodobé financování* . Praha: Ekopress.

Veber, J., Srpová, J., 2005. *Podnikání malé a střední firmy*. Praha: Grada Publishing.

Vyhláška č. 150/2007 Sb. ze dne 19.6.2007.

Ward, K., 1992. *Strategic management accounting*. Oxford : Butterworth-heinemann.

Wickham, P., A., 2006. *Strategic entrepreneurship.* Harlow : Pearson Education.

Wupperfeld, U., 2003. *Podnikatelský plán pro úspěšný start.* Praha: Management Press.

Zouhar, V., 2008. *Založení malého podniku na výrobu elektrické energie alternativními zdroji– fotovoltaické elektrárna.* Brno: Masarykova Univerzita.

19 List of pictures

20 List of tables

21 List of graphs