Renewable Energy Projects in Bulgaria

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Renewable energy projects in Bulgaria: How should Balkans Investment Consulting Agency support the foreign investors in their efforts to enhance their returns on renewable energy projects in Bulgaria

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Foreword

This research was performed with the help and valuable insights of the following professionals and organizations:

- Mr. Andrey Bachvarov – General Manager and owner of Balkans Investment Consulting Agency. Mr. Bachvarov's valuable inputs as an owner of various businesses in Bulgaria and extensive professional experience in the USA, contributed with assessing the practical applicability of the models presented in this research;
- Mr. Toma Nedyalkov – Procurist of Balkans Investment Consulting Agency. Mr. Nedyalkov's in-deepth knowledge about the Bulgarian renewable energy sector provided a valuable framework for the relevant risks which an investor could encounter in Bulgaria and gave an insight about the financial techniques for evaluation of a green energy investment opportunity;
- Mr. Vladi Vladimirov – Manager Balkans Countries in Balkans Investment Consulting Agency. His knowledge about the European subsidies and incentives offered in Bulgaria for development of renewable energy power plants were a valuable insight about the additional cash flows a foreign investor could obtain in Bulgaria upon investment in such projects;
- Mr. Theodore Tsacheff – Co-owner of a 3.5 MWp solar photovoltaic power plant in Bulgaria and a professional with extensive experience with Shell. Mr. Tsacheff's understanding about the Bulgarian renewable energy industry and vast international experience in the energy sector validated the practical application of the models presented in the research and provided a valuable insight about the pre-investment techniques to be used in order the risk level of a given investment to be determined;
- Mr. Vladimir Alitchkov – Co-owner of a 2 MWp solar photovoltaic power plant in Bulgaria and owner of Solar Vision - a company which develops solar photovoltaic and biomass energy projects in Bulgaria. His vast international and local experience assisted this research by providing an insight which of the researched techniques should be considered in order the returns of a foreign investor in renewable energy projects to be enhanced;
- Balkans Investment Consulting Agency – Consulting company with a vast experience in the Bulgarian renewable energy sector and fund manager of CEZ Bulgarian Investments, a EUR 40 million renewable energy investment fund fully owned by CEZ, a.s., targeting renewable energy investment opportunities in Bulgaria.

The main issues which occurred during the course of the research is the fact that the renewable energy sector in Bulgaria is still in its initial stage of development, hence there were a limited number of studies conducted on the industry. In addition, the access to empirical data constituting the financial audits of operational renewable energy power plants in Bulgaria is not available in the public domain. This limited the initial focus of the study to provide specific numerical information about the effect of the proposed models and techniques on the financial returns of the capital invested by foreign investors in renewable energy projects in Bulgaria. Therefore, this study undertook a different course and presented various techniques and mechanisms which, if implemented, could positively affect the returns of the investors.

Glossary of Terms

For the sake of clarity and lack of ambiguity this study might introduce specific industry related or generic terms and abbreviations that need further explanation.

- **ANP –** Analytical Network Process, a model used for the evaluation of the micro risk level of a RES investment opportunity;
- **BGN –** Bulgarian Lev, the national currency of Bulgaria;
- **BICA –** Balkans Investment Consulting Agency;
- **BPP –** Biomass Power Plant;
- **CO2 –** Carbon Dioxide;
- **EDC –** Electric Distribution Company. In Bulgaria there are three Electric Distribution Companies, namely CEZ, E.ON and EVN;
- **EU –** European Union;
- **EUR –** Euro;
- **FIT –** Feed-in Tariff. Preferential price at which the electricity generated by a renewable energy power plant in Bulgaria is purchased by one of the Electric Distribution Companies or the National Electric Company;
- **GW –** Gigawatt. 1 GW equals to 1, 000 MW. A unit measuring the capacity of installed capacity of wind and hydroelectric power plants. In the case of solar photovoltaic and biomass power plants, the relevant term is **GWp** (Gigawatt peak) and **GWe** (Gigawatt electricity) respectively;
- **GWh –** Gigawatt hour. 1 GWh equals to 1, 000 MWh. A unit measuring the electricity output of a RES power plant;
- **HPP –** Hydroelectric Power Plant;
- **KW –** Kilowatt. A unit for measuring the capacity of installed capacity of wind and hydroelectric power plants. In the case of solar photovoltaic and biomass power plants, the relevant term is **KWp** (Kilowatt peak) and **KWe** (Kilowatt electricity) respectively;
- **KWh –** Kilowatt Hour. A unit measuring the electricity output of a RES power plant;
- **Local –** Refers to Bulgaria;
- **MW –** Megawatt. 1 MW equals 1, 000 KW. A unit measuring the capacity of installed capacity of wind and hydroelectric power plants. In the case of solar photovoltaic and biomass power plants, the relevant term is **MWp** (Megawatt peak) and **MWe** (Megawatt electricity) respectively;
- **MWh –** Megawatt Hour. 1 MWh equals to 1, 000 KWh. A unit measuring the electricity output of a RES power plant;
- **NEC –** National Electric Company;
- **Off-take period –** The number of years each of the Electric Distribution Companies in Bulgaria (CEZ, E.ON and EVN) or the National Electric Company is obliged by law to purchase the electricity generated by a renewable energy power plant operating in Bulgaria. For solar photovoltaic and biomass power plants this mandatory purchasing period is 20 years, for hydroelectric power plants 15 year and for wind power plants 12 years;
- **PEST –** Political, Social, Economic and Technical analysis performed for the evaluation of the macro risk level of a given RES investment opportunity;
- **PPA –** Purchase Power Agreement. A long-term contract between the owner of a renewable energy power plant and the respective EDC or NEC outlining the off-take period and the FIT at which the electricity generated by the power plant will be purchased;
- **PV –** Photovoltaic;
- **RES –** Renewable Energy Sources;
- **RESA –** Renewable Energy Sources Act. The main law related to the renewable energy sector in Bulgaria;
- **ROV –** Real Option Valuation, a model used for the evaluation of the financial feasibility of a given RES investment opportunity;
- **TW –** Terawatt. 1 TW equals to 1, 000 GW;
- **TWh –** Terawatt hour. 1 TWh equals to 1, 000 GWh;

1. Executive Summary

Humanity depends heavily on the production and world reserves of fossil fuels. Such a strong claim could be made due to the fact that the majority of energy consumed by man is derived from oil, coal and natural gas - the most frequently used non-renewable energy resource (International Energy Agency 2010). According to Lescaroux (2011) and Banos et al. (2011) the civilization as it is known today will become even more dependent on the above resources as the Global demand for energy will soar due to the increase in the World population and the rising energy needs of the biggest emerging economies as Brazil, Russia, India and China. The standpoint of the author is further supported by Schoder (2011) and the Energy Information Administration (2010) who claim that the current consumption of energy is 132,485 TWh per annum and by 2035, it is expected to increase by 60%. Many experts in the field claim that the due to this increase in energy consumption and the limited reserves of fossil fuels, the peak in production[1] of oil, according to the International Energy Agency (2010) the energy resource most frequently used by the people, will occur in the next two decades (Sorrel et. al. 2010, Hicks and Nelder 2008, Bentley 2002, Laherrere 2001). Ongena and van Oost (2006) and Leggett (2006) claim that the occurrence of such an event would cause a deep Global energy crisis which could alter the society in the 21st century.

A substantial number of scholars support the idea that the future energy supply across the world lies with technologies producing fuels and electricity from alternatives of the conventional energy sources, namely renewable energy sources (**"RES"**) such as solar, wind, hydro and energy from biomass (Boyle 2003, Sørensen 2006, Yang 2007, Banos et al. 2011). Their standpoint is further supported by Maczulak (2010), European Environment Agency (2009), Lund and Mathiesen (2009) and Sissine (2007) who claim that the technologies which generate electricity from non-fossil energy sources could help Humanity prevent potential energy crisis in the future, eliminate and prevent adverse climate changes, promote the local economic and employment growth, as well as make a country independent both from the depleting fossil fuels and imported conventional energy resources from 3rd countries. The latter is an acute problem for many member states of the European Union (**"EU"**) due to their dependency on conventional energy resources imported from the African countries, OPEC and Russia (Bahgat 2007, The Economist 2008).

In aggregate, the European Union is the entity with the most renewable energy power plants installed capacities in the world – as of 2011 more than 250 GW are constructed and operating, about 4 times greater in comparison with the 60 GW installed in the USA (International Energy Association 2011). The main reason for the leading position of the EU is the support which the renewable energy industry receives, as evident by the promulgated on April 23, 2009 by the European Parliament, Directive 2009/28/EC which obliges all member states of the EU to increase the usability of RES in their energy mixes, the threshold for every country being tailored to its own internal regional and economic specific capabilities. The target of the EU is by 2020 at least 20% of the overall energy mix of the EU-27 members to be derived from green energy (European Committee for Standardization 2009; EurActiv 2008). Bulgaria as a newly accepted member of the EU is also obliged to follow the articles outlined in the directive and by 2020 to derive 16% of the country's overall energy needs from RES (European Commission Energy 2010).

As of 2007, when Bulgaria was accepted in the EU, the RES contributed barely with 7.3% to the overall energy mix of the country (Ministry of Economy, Energy and Tourism 2007). In order to more than double the usage of RES in the country in the next decade and meet its green energy target, the Bulgarian Government has undertaken a number of incentives to stimulate the investments in RES power plants which generate green electricity and fuels from solar, wind, hydro and biomass energy sources. Some of these stimulus include relaxed credit lines and administrative procedures, priority connection of the power plants to the grid, guaranteed return on investments through secured purchase of the electricity

[1] Peak of oil refers to the period when the Global maximum oil output production denominated in millions of barrels of crude oil extracted per day is reached

generated by RES power plants on preferential prices, also referred to as feed-in tariffs (**"FIT"**) and for a certain fixed by law off-take period[2] (Ministry of Economy, Energy and Tourism 2011).

As a result of the undertaken by the Bulgarian Government incentives, many international investors have been attracted to step in the Bulgarian RES sector (Deloitte 2009, Borislav Stefanov quoted in Eco Media 2011 and The Bulgarian News 2011, Invest Bulgaria 2011). However, regardless of their interest in the Bulgarian RES market, some investors are still cautious to spend their funds in the country (Invest Bulgaria Agency 2008). The main reasons are that, according to the World Bank (2008) and Mr. Borislav Stefanov, Executive Director at the Bulgarian Investment Agency, quoted in Dnevnik (2011), the Bulgarian investment climate is perceived as risky and highly bureaucratic.

Due to the above outlined country specific risks and issues, many international investors interested to devote their capital in Bulgaria do not have a clear concept how to manage their funds in order to enhance the returns on their investments. Furthermore, up to date, in the public domain there is no an available research which thoroughly guides the investors through the course of their RES investments in Bulgaria. This article attempts to fill this gap and provide the interested investors with an appropriate roadmap which steers them from Point A, being their indicated interest to invest in a RES project in Bulgaria, up to Point Z, the time when they will start profiting from their endeavors. This "journey" will be analyzed in the light of the support which Balkans Investment Consulting Agency (**"BICA"**) should provide to the investors interested in Bulgarian renewable energy projects in order to assist them to enhance their returns.

The research commences with a general overview of the future energy supply and demand, and concludes that the future energy supply lies with the development of RES power plants. In turn, the study considers the legislation framework and incentives undertaken by the EU and the Bulgarian government in order to stimulate the development of RES power plants in Bulgaria. Some of these incentives are preferential credit lines, relaxed administrative procedures pertaining to the development of a RES power plant in the country and preferential purchasing prices for the electricity generated by green power plants. It turn, using Porter's (2008) Five Forces model, this study looks into the market forces which shape the RES sector in Bulgaria and concludes that the suppliers have a significant bargaining power over the investors, whereas the consumers have very limited negotiation advantages over the investors. In addition, the Five Forces analysis presents the RES power plants as highly substitutable due to the unpredictable supply and generation of electricity from such facilities and the relatively high capital expenditures required for such investments. The analysis concludes that the RES market in Bulgaria is rather competitive as the threat of new entrants is high due to the profitable RES projects' Internal Rates of Return (**"IRR"**) and low barriers to entry. Last but not least, this section lists the main type of foreign investors in Bulgaria interested in RES investment opportunities, namely institutional (i.e. Independent Power Producers (**"IPP"**), Electric Distribution Companies[3] (**"EDC"**) and Pension Funds), strategic (i.e. producers of RES power plants system equipment) and private equity funds (i.e. funds formed by the private equity of affluent personalities) investors.

The research groups the returns maximization techniques into 3 clusters: pre-investment returns enhancing tools, post-investment returns maximization tools and mechanisms which enhance the returns of the foreign investor after the mandatory by law off-take period for the generated electricity at a fixed FIT expires. Part of the pre-investment tools are macro and micro project risk lelvel evaluation mechanisms, instrument for evaluation of the financial feasibility of a given RES project, local subsidies and incentives which could enhance the returns of the investor and a brief discussion about the tax planning, external financing and currency hedging tools which could further enhance the returns of the foreign investors. For determining the macro risks, a Political, Economic, Social and Technical (**"PEST"**) analysis is considered (Forbes et. al. 2008). The PEST analysis concludes that (i) the RES sector in Bulgaria is highly regulated, (ii) the FIT for biomass and hydro energy are constantly increasing, whereas those for wind and solar decreasing, (iii) the social opinion towards the solar and wind energy is

[2] Off-take period refers to the number of years each of the Electric Distribution Companies operating in Bulgaria or the National Electric Company is obliged by law to purchase the electricity generated by a renewable energy power plant constructed on the territory of Bulgaria

[3] The three EDCs in Bulgaria are CEZ, E.ON and EVN;

negative, whereas the one for biomass is positive and (iv) the technology risk for the development of RES power plants in Bulgaria is relatively low due to the well-developed general electricity industry in the country.

Once the macro risks have been analyzed, this study uses an Analytical Network Process (**"ANP"**) model which analyzes each step pertaining to the development of a RES power plant and identifies the main micro risks relevant to these steps (Aragone´s-Beltra´n et. al. 2010). These risks are in turn clustered in groups of political, social, technical, economic, time delays and legal risks. In order to determine the significance of the identified risks for development of a RES power plant in Bulgaria, their importance is weighted and a matrix which determines the correlation between them is developed.

After shortlisting the least risky projects, for evaluation of their financial feasibility this study considers the Real Option Valuation (**"ROV"**) model as an alternative of the Capital Budget one (Kumbaroğlu et al. 2006). The major differences between the two financial tools are that ROV considers real options which may occur in the future and affect the RES project IRR levels and Net Present Value (**"NPV"**). Examples for such options are decrease in RES technology prices, increase in demand for electricity, fossil fuel prices and feed-in tariffs.

Following the selection of the financially feasible RES investment opportunities, this research looks into the local subsidies and incentives which could enhance the returns of a given green power plant. The local stimulus which have been identified include preferential credit lines from the European Bank for Reconstruction and Development (**"EBRD**"), European funds as per operational programs "Development of the rural regions" and "Energy efficiency" for stimulating the development of RES power plants in Bulgaria and the option for a tax holiday offered by the Bulgarian government (BEERECL 2011, Ministry of Agriculture and Foods 2008 and Bulgarian Law for Corporate Taxation 2011). The study additionally briefly describes the various external financing options for a foreign investor, the tax planning which he should undertake in order to avoid double taxation of the repatriated funds to the investor's home country, as well as hedging the exposure to currency fluctuations between the Bulgarian Lev (**"BGN"**) and foreign investor's home country's currency.

After the RES power plant has been constructed and put into operation, this paper looks into two financial options to be used for maximization of the investor's returns. The first one is refinancing the project using the Purchase Power Agreement (**"PPA"**) signed by the investor and the respective EDC or the National Electric Company (**"NEC"**). This is a contract which outlines the mandatory by law off-take period and the price at which the electricity generated by the power plant will be sold from the investor to the EDC or NEC. It could serve as a security to be presented to a bank, on the basis of which the investor's equity contributed in the RES power plant to be refinanced by debt, hence the cost of capital and opportunity costs of the investor to be decreased. An additional instrument for enhancing the returns of the investors introduced in this section is the investment exit stage which would allow the investor to receive the funds invested by him in the power plant "today"[4], hence bypass any operational costs and political risks pertaining to the operation of the power plant. This technique further allows the investor to avoid the opportunity costs related to his funds "locked" in the project, allowing him to take advantage of various RES additional investment opportunities which may arise in Bulgaria.

Last but not least, this research presents the returns enhancing techniques for a RES power plant after the mandatory by law off-take period at a fixed FIT expires. The first presented tool is the RES power plant to sell future call options on the generated electricity (Bolinger and Wiser 2008). This technique is considered as a viable source of funds, as the scholars suggest that in the next 3 – 5 years there will be parity between the green and conventional energy. However, as the electricity generated by RES power plant does not depend heavily on the increasing fossil fuel prices, the future electricity prices generated by such facilities are expected to be stable. In turn, a big demander of electricity could buy a future call option on the electricity generated by such power plant in order to hedge its exposure to the constantly fluctuating fossil fuel prices. The last presented mechanism for increasing the returns of an investor is the

[4] "Today" refers to the fact that if the investor exits the project, he will sell to another investor at a NPV which equals to all the future incomes of the power plant, discounted at a certain factor. This implies that the investor will receive back the funds invested by him in the project "today" instead of waiting for the future incomes of the power plant

trade with green certificates which constitute commodities issued for each CO2 emission free MWh of electricity generated by a RES power plant. They are traded in a manner similar to the one of financial commodities as shares and bonds on various capital markets across the globe (Ringel 2005).

The research concludes with a particular set of advices aimed at BICA if the company is to assist the foreign investors to enhance the returns on their investments. These advices suggest that the company should implement an Analytical Network Processing and Real Option Valuation models when it evaluate the riskiness and financial feasibility of a given investment opportunity. In addition, study suggests a set of refinancing and investment exit stage mechanisms. Last but not least, the research assumes that the company should undertake innovative for the Bulgarian market practices as trade with green certificates and selling future call options on electricity generated by a RES power plant.

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2. Introduction

On April 23, 2009 the European Parliament promulgated Directive 2009/28/EC (European Committee for Standardization 2009; EurActiv 2008). As per the Directive, by 2020 the green energy should contribute with a particular percentage to the overall energy mix of each of the 27 member states of the European Union (**"EU"**). Bulgaria as a newly accepted EU member has to reach 16% green energy of the country's overall energy mix by 2020. In 2007, when Bulgaria was accepted in the EU, the Renewable Energy Sources (**"RES"**) contributed barely with 7.3% of the overall energy mix of the country (Ministry of Economy, Energy and Tourism 2007). In order to more than double this percentage, the government has introduced a number of investor-friendly practices aimed at stimulating the development of RES power plants in the country (Ministry of Economy, Energy and Tourism 2011). These incentives have attracted a number of foreign investors to step in the Bulgarian RES sector. However, due to the local specific regulatory, administrative and legislative environment, lots of foreign investors have contributed their funds in the sector without having a clear overview how to enhance the returns on these funds. The main topic of this research was inspired by the fact that in the public domain there is not an available research which provides the foreign investors with a detailed overview of the tools and mechanisms they could employ in order to enhance their returns in RES projects in Bulgaria. Therefore, the following research question was formed:

"How should Balkans Investment Consulting Agency support the foreign investors in their efforts to enhance their returns on renewable energy projects in Bulgaria?"

This research question was addressed in the light of Balkans Investment Consulting Agency (**"BICA"**) as a leading RES Consultancy Company in Bulgaria and a fund manager of CEZ Bulgarian Investments, a EUR 40 million renewable energy investment fund fully owned by CEZ, a.s., targeting renewable energy investment opportunities in Bulgaria. The main motive for formulating the research question in such a manner was to consider the models and tools discussed in this study both from academic and practical perspective.

As the research question implies, the main audience of this article are foreign organizations interested to invest in RES projects in Bulgaria. It is assumed that these institutions would have a basic knowledge about the RES industry in general and the main terms pertaining to it. However, for the sake of avoiding any assumptions and bypassing ambiguity in the readers not familiar with the concept of green energy, this research will briefly analyse the essence of RES projects and power plants.

For the sake of answering the main research question, this research looked into various tools and models analysing the eligibility of RES investment opportunities. The main limitation in this process was the fact that the RES industry in Bulgaria is still in its initial phase of development and the lack of empirical data about the financial results of the already operating RES power plants in Bulgaria. As a result, in the public domain there were a limited number of studies looking into the Bulgarian RES industry. However, this research considered models applied in the EU leading green energy markets – the Spanish and the German ones. In turn, the research triangulated the models' eligibility and applicability to the Bulgarian reality by cross-validating them with interviews with local RES practitioners and real-life business practices employed by BICA. The main motive for selecting such a research design was to provide the foreign investor with academically proven models which could be used in the real-life business conditions of the Bulgarian RES industry. In fact, this is the main goal of this research – to provide the foreign investors with an eligible framework of the most important practices to be considered by them upon an investment in a RES project in Bulgaria. In turn, each of the options outlined in the research could be analysed in a greater detail and be a topic of follow-up studies.

In Chapters 4.1 and 4.2, this study looks into the future energy supply and demand, and explains why and what incentives have been undertaken by the EU in order to foster the development of RES power plants in the community. Chapters 4.3 and 4.4 provide an analysis of the progress of the Bulgarian RES segment and the main stimulus which supported this progress and attracted a number of foreign investors to step in the Bulgarian RES market. Chapter 4.5 provides a set of tools, models and local incentives undertaken both the EU and the Bulgarian government which could have a positive effect on the foreign investors' returns in RES projects. In Chapter 5 the practical eligibility of each of these models is discussed. Based on the findings and discussions made, Chapter 6 provides a set of recommendations to BICA aimed at supporting the company to assist the foreign investors in their efforts to maximize the returns on their investments in RES projects in Bulgaria.

This research considers various techniques and models; however, due to the limited scope of the study and limited empirical information in the public domain, it notices the importance and briefly describes the tax planning, hedging techniques and external financing topics. The research further assumes that the foreign investments are Greenfield investments[5], as every RES project has to be constructed from the ground up and put into operation in order to generate revenues. Moreover, even though important for the development of a RES power plant, the study does not look into Engineering, Procurement and Construction companies which design and construct such facilities due to the excessively technical aspect of such a discussion. Last but not least, the research does not look into profit maximizing tools related to the salvage value of a RES project as the asset lifetime of a RES technology exceeds 25 years, hence an analysis related to such a distanced period would require in-depth analysis not falling in the scope of this research.

3. Methodology

The initial focus of this study was to form various hypotheses and examine particular financial tools and techniques as hedging, external and lease financing and compares them to empirical data sourced from the financial audits of already operational RES power plants in Bulgaria. It was considered this to be performed using the SPSS statistic software package and statistical tests as the t-test, chi square test, correlation index and probability distribution. However, due to the lack of empirical data in the public domain and the refusal of owners of already operational RES power plants to provide their financial audits as they are confidential information, this research undertook a different course and explored various financial, strategic and marketing techniques which could increase the returns of an investor in a RES power plant in Bulgaria.

Given the fact that first Renewable Energy Sources Act was promulgated in Bulgaria in 2007, the RES industry in the country is still a developing sector with a limited number of researches performed about it. Owing to this reason, this research is considered as an explorative one. It considered various secondary researches, in-depth and semi structured administered and phone interviews with industry experts as well as a particular case study. The advantage of such a type of research is that it provides answers to "how" type of questions, just like the one addressed in the main research topic. In addition, it looks into matters which have not been studied before. As the main goal of this type of researches couples with the main goal of the research topic addressed in this paper, the explorative research has been considered as most applicable research design. It should be noted that regardless of the listed advantages, the explorative type of researches does not consider detailed quantitative data and does not provide clear information about how often and what is the exact effect between two variables, as in the case of this study a financial tool and return levels.

In order the secondary findings to be triangulated, this research considered interviews with 5 local RES industry experts. The research employed nonprobability sampling due to the fact that the number of RES industry experts with the relevant business background in Bulgaria is rather limited. The initial focus was on 9 experts, however, only 5 interviewees agreed to participate in the research. After the models have been cross-validated with the industry experts, the research used one of them in a case study for the sake of examining its applicability for the analysis of a solar photovoltaic investment opportunity.

Each of the interviews took approximately an hour. It commenced with specific questions derived from the secondary information sources, followed by in-depth discussion about additional topics which arose

[5] Greenfield investment is a type of a foreign direct investment where a foreign investor constructs an operational facility from the ground up

during the interviews. Each interview was digitally recorded so the interviewer could concentrate on the discussion itself but not on taking notes. This qualitative data was analyzed using the Strategic Options Development and Analysis (**“SODA”**) analytical tool (Please refer to Appendix 1 for a visual overview of the SODA analytical tool). SODA is an instrument used by consultants when handling complex problems consisting of multiple variables. The method uses the most significant findings and concepts discovered during the conducted interviews. In turn, they are presented by a cognitive map which make a correlation between all the ideas discovered during the interviews. The SODA is a viable tool which helps a researcher to outline all the concepts covered during an interview in an eligible easy to read manner. Therefore, as this research incorporates various concepts, tools and models, SODA was considered as an eligible qualitative data analytic tool.

4. Findings

4.1. Future world energy supply and demand

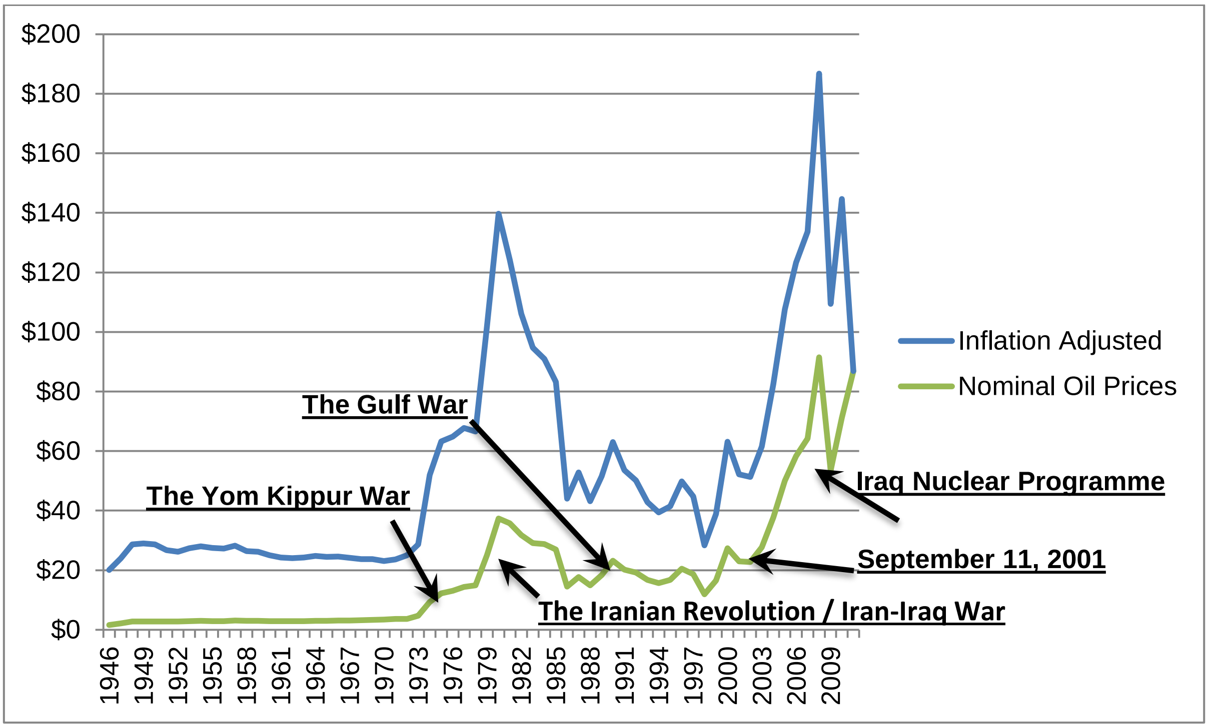
Due to the growing world population and the increasing energy needs of the fast developing economies, the current energy consumption of 132, 485 TWh per annum is expected to increase by 60% by 2035 (Schoder 2010, Energy Information Administration 2011, World Bank 2011, Yanling et. al. 2011). According to International Energy Agency (2010) humanity relies substantially on the fossil fuels as a main energy source. Due to this reason and the expected growth of future energy demand, many scholars support the concept that the fossil fuels will deplete in the near future and an energy crisis will occur (Sorrel et. al. 2010, Hicks and Nelder 2008, Bentley 2002, Laherrere 2001). In these regards, one of the most prominent concepts is the Hubbert’s Peak Theory which states that if the USA continues to use its oil reserves at the same rate, by the beginning of the 21st century the country will reach its oil production peak (Hemmingsen 2010). According to Energy Information Administration (2011), in 2010 the US produced with approximately 36% less barrels per year in comparison with the early 1970’s. These statistics imply that Hubbert’s theory has grounds and an event of oil peak and eventual depletion of the fossil fuels could occur across the world in the near future.

According to Shafiee and Topal (2009) due the expected future scarcity of non-renewable energy sources, the increased costs for excavation of fossil fuels and complex political issues in the countries with the greatest reserves of conventional power resources, limiting the access to them, the prices of fossil fuels in the future will increase and could cause an energy crisis across the globe. The viewpoint of the author is further supported by Wu and Ni (2011), proving with their empirical research that the soaring prices of fossil fuels could cause an increase in the consumer price indexes on a world scale. Additionally, Cologni and Manera (2008) affirm a positive correlation between the increase in the prices of natural resources and surge of the interest rates in the G-7 countries. All of these statements are further supported by Graph 1, exemplifying the positive correlation between the increases of oil prices, inflation rates and major political events on a world scale.

This exploration implies that the economic prospect of many countries is contingent on their energy independency and constant fossil fuels supply. However, due to the fact that not every country has its own fossil fuels production, a substantial number of scholars believe that the energy independent and economic stable future of these countries lies with the development and utilization of technologies producing fuel and electricity from RES such as solar, wind, hydro and biomass energy (International Energy Agency 2010, Boyle 2003, Banos et. al. 2011).

The employments of RES technologies have various advantages. For instance, as Panwar et. al. (2011) state, the use of renewable energy protects the environment by limiting the number of CO2 emissions released in the atmosphere. In addition, according to Lund and Mathiesen (2009) and Sissine (2007) the employment of renewable energy resources could make a country independent both from the depleting fossil fuels and imported conventional energy resources from third countries. The latter is an acute problem for many member states of the European Union (**“EU”**) due to their dependency on conventional energy resources imported from the African countries, OPEC and Russia (European

Commission of Energy 2011). The previous statement is underpinned by the European Commission (2011), stating that in 2010 the EU imported about 61% of the total natural gas consumed in the community. By 2030, this percentage is expected to go up to 80%. The European Commission (2010) additionally supports the findings of the scholars by stating that the Union's import dependency of oil and fossil fuels in general is, respectively, 82.6% and 53.1%. These statistics imply why the EU has undertaken strict measures to limit its dependency on imported conventional energy resources and to promote the development of electricity and fuel generated by RES power plants. The following section will analyze the Directive and incentives introduced by the EU in order to promote the development of power plants generating electricity and fuels from RES.



Graph 1. Major World-scale Political Events, Surge in Oil Prices and Inflation Rates

Source: Illinois Oil & Gas Association (2011), Bureau of Labor Statistics (2011);

4.2. Renewable energy in Europe

As the analysis in Chapter 4.1 implies, the EU member states depend heavily on imports of energy resources from 3rd countries. Due to this reason and additional political and socioeconomic factors such as increased energy consumption, soaring fossil fuels prices, acute environmental problems and the pressure the greenhouse emissions in the EU to be decreased as per the Kyoto Protocol (1997) of the United Nations Framework Convention on Climate Change, in 2009 the European Parliament passed Directive 2009/28/EC for the sole purpose of stimulating the generation and consumption of electricity and fuels generated by renewable energy power plants (Marques et. al. 2010).

As per Directive 2009/28/EC (2009), by 2020 the green energy should reach, respectively, 20% from the overall energy consumption and 10% of the energy used in the transport of the entire EU. Furthermore, the legislation outlines that every member country has its own mandatory specified national target set at a level which will encourage investors, both local and foreign, to invest in renewable energy projects in the respective country. Such incentives, described in the following section, have been also undertaken by the Bulgarian government.

4.3. Renewable energy sector in Bulgaria

On January 1, 2007 Bulgaria was accepted as a member of the EU (Euractiv 2007). As such, just like all the other member states, by 2020 the country is obliged to reach a certain national target for the share of renewable energy from its overall gross energy consumption. According to 2009/28/EC Directive (2009), the national target of Bulgaria is 16%[6]. As of 2007 the renewable energy contributed barely with 7.3% of the country's overall energy mix. If Bulgaria is not to reach its green energy target by 2020, the EU will impose financial sanctions over the country (Bennink et. al. 2011). In addition, the country has an import dependency of respectively 100% and 91.5% of the two most commonly used energy sources in the country, namely oil and natural gas (European Commission 2010). Furthermore, according to the World Bank (2011), the electricity consumption in the country increased from 2001 to 2008 by approximately 17.6%. All these factors encouraged the Bulgarian government to introduce a number of incentives aimed at stimulating the generation of electricity and fuels from RES.

Following the requirements to each member state outlined in the 2009/28/EC Directive (2009), the Bulgarian government developed a long-term national plan for the promotion of development of power plants generating electricity and fuel from RES. The national plan outlines a number of incentives stimulating the progress of the renewable energy sector in the country, including a strategy for enforcing a legal framework which outlines the mechanisms and anti-discriminatory practices[7] related to the integration of the green power plants to the grid, commercial support as for instance secured procurement of the electricity generated by renewable energy power plants for a fixed off-take period, direct financial support such as preferential credit lines and financial schemes, as well as relaxed administrative procedures[8] related to the development of renewable energy projects and their connection to the grid (Ministry of Economy, Energy and Tourism 2011a). Moreover, in 2007 the Bulgarian government passed the country's first Renewable Energy Sources Act (**"RESA"**) which introduced the preferential prices, also referred to as feed-in tariff (**"FIT"**) for electricity generated by renewable energy power plants as a mechanism for stimulating the development of such projects in the country (Global Legal Group 2011). Moreover, as of May 3, 2011 the Bulgarian new RESA was promulgated. As per the Act, each Electric Distribution Company (**"EDC"**) in the country or the National Electric Company (**"NEC"**) are obliged to buy the electricity generated by the RES power plants for a fixed off-take period at a fixed for the entire period FIT determined every year by the State Energy and Water Regulatory Commission (**"SEWRC"**) (The State Gazette 2011). All these legal frameworks and mechanisms have attracted various foreign investors to step in the Bulgarian RES sector and marked the development of the renewable energy sector in Bulgaria, a brief analysis of which will follow.

4.3.1. The Bulgarian RES progress

The purpose of this section of the paper is to provide the reader with an insight about the meaning of a renewable energy project and provide a brief overview of the technology behind generating electricity, fuels and heat from the most frequently used RES in Bulgaria, namely solar, hydro, wind and biomass. The majority of renewable energy power plants in Bulgarian are developed in the form of Special Purpose Vehicle (**"SPV"**) legal entities - form of enterprises established for the sole purpose of fulfilling a specified and temporary objective, as in this case, the development of power plants generating energy from RES (Business Dictionary 2011). In most cases, a RES project constitutes a land plot with all the relevant documents as a construction permit and grid connection contract with the respective EDC or NEC. These documents allow the investor to commence construction works on the project and put it into operation by connecting it to the grid. This section of the study will provide brief technology analysis for each of the 4 main types of RES power plants, which will be followed by an overview of the progress and issues of the relevant green energy segment in the country.

[6] The Directive does not represent these 16% in terms of MW(p) installed capacity of RES power plants, as by 2020 the demand for electricity in Bulgaria is expected to increase, hence new capacities of RES power plants has to be constructed in order the country to meet its green energy target

[7] By law, the Electric Distribution Companies or the National Electric Company in Bulgaria is obliged to purchase the electricity generated by RES power plants. However, due to the high purchase price of electricity generated by such facilities, in the past these institutions undertook discriminatory practices regarding the connection of RES power plants to the grid. As a result, the government introduced a number of anti-discriminatory regulations against such practices

[8] Administrative procedures aimed at easier issuance of the documents related to the construction and connection to the grid of a RES power plant

4.3.1.1. Solar Energy Power Plants

Solar power plants, also referred to as photovoltaic (**"PV"**) power plants, generate electricity as a result of the sun irradiation. The installed capacity of the solar energy power plant is measured in MWp. The "p" part stands for "peak" and measures the maximum power output of a 1 m^2 photovoltaic module at sunlight intensity of 1, 000 kW / m^2 when the constant temperature of the PV module is 25° (Boyle 2003). As Foster et. al. (2009) state, the main components of every solar power plant are PV modules, PV inverters, mounting structures and grid connection equipment.

PV modules, which represent approximately 50% of the costs of an entire solar power plant, generate electricity from the sun irradiation. This electricity is in the form of direct current electricity. PV inverters convert the direct current electricity to alternative current one before it is fed to the grid (Kjaer et. al. 2005). A mounting structure is the basis of a solar power plant. It accommodates the PV modules and, depending on the design of the power plant, the PV inverters. These components are connected via cables to an electric transformer station which connects the power plant to the grid.

The capital expenditures related to the installation of 1 MWp of a PV power plant in Bulgaria are approximately EUR 2 million[9]. The operational expenditures vary and depend on the system components which have to be substituted in the course of operation of the power plant. Depending on its location, a PV power plant with installed capacity of 1 MWp will generate from 1, 150 kWh up to 1, 300 kWh per hour. These figures imply that if a power plant works at its full potential for 5 hours, it will generate electricity equal to the consumption of power by an average Bulgarian consumer (Nation Master 2011).

In 2010, in Bulgaria there were applications for grid connection contracts with CEZ, E.ON, EVN and NEC for solar projects with total installed capacity of over 1.3 GWp to be connected to the grid (Bulgarian Photovoltaic Association 2010). However, according to Nikola Gazdov, President of the Bulgarian Photovoltaic Association, as of mid-2011 the total installed capacity of operational PV power plants in the country was about 30 MWp (Energy Review 2011). This implies that there are a lot of developers of solar projects in the country which are seeking for fast profits by developing fictitious solar projects only with grid connection contract and construction permit. These developers, which also may be referred to a speculants, develop the projects and seek a foreign investor who will buy them, without taking any due diligence whether the project is eligible for construction and operation of a power plant (Bulgarian Photovoltaic Association 2010). Due to this overheated PV sector, the solar segment in Bulgaria is considered as rather speculative. Owing to this reason and in order a market bubble in the PV segment to be prevented, the latest Renewable Energy Sources Act decreased the off-take period for electricity generated by solar power plants from 25 to 20 years. Furthermore, the latest FIT for electricity generated by large-scales PV power plants (those with installed capacity greater than 200 kWp) determined by State Energy and Water Regulatory Commission is 30.5% lower than the last year's one. Regardless of these changes which could affect the financial returns of the foreign investors, there is still a substantial interest for PV projects in Bulgaria.

4.3.1.2. Wind Energy Projects

Wind power plants generate electricity by harnessing the wind kinetic force. The potential of the wind power is measured in 1, 000 kW / m^2. The installed capacity of the wind energy projects is measured in MW, whereas, the electricity output in MWh. Each wind power plant consists of a number of wind turbines interconnected to the grid via specific electric equipment (Nelson 2009).

Wind turbines harness the wind kinetic energy and convert it to electricity. They contribute with about 80% of the overall capital expenditures related to a wind power plant (European Wind Energy Association 2011). Each wind turbine consists of tower, rotor blades and nacelle. The tower is the basis of each wind turbine. The nacelle is positioned on the top of the tower and accommodates an electricity generating components of a turbine. Blades harness the wind flow and using equipment located in the nacelle generate electricity. In turn, electricity generated by the generator is fed to a transformer station located either in the turbine itself or outside it. The transformer steps up the voltage of the generated

[9] Based on a commercial offer by an Engineering, Procurement and Construction company for the installation of a PV power plant in Bulgaria

electricity for the sake of decreasing the electricity losses during its transmission. From the transformer station the electricity is transported via underground cables to an on-site electrical substation where the electricity is further stepped up and fed to the grid.

The capital expenditures for 1 MW of a wind power plant installed capacity are about EUR 1.3 million[10]. The operational expenditures vary and depend on the system components which have to be substituted during the course of operation of the power plant. According to the European Wind Energy Association (2011a), as of the end of 2010 the total installed capacity of wind projects in Bulgaria totaled 375 MW. However, due to major issues with the grid infrastructure in the areas with greatest wind energy capacity, constructed wind power plants cannot operate at their full potential and installed capacity as the grid cannot intake the electricity generated by them, a major risk related to the wind energy sector in Bulgaria (Dnevnik 2011a). Additional issue which according to the Bulgarian Wind Energy Association (2011) inhibits the returns of the investors in the wind sector in Bulgaria is that according to the latest Renewable Energy Sources Act, the off-take period for electricity generated by wind power plants decreased from 15 to 12 years.

4.3.1.3. Hydro Energy Projects

Hydro energy is the most widely used RES in Europe and Bulgaria (European Wind Energy Association 2010, Karashkov 2011). Each hydroelectric power plant (**"HPP"**) generates electricity using the gravitation force of the water. The installed capacity of such renewable energy projects is measured in MW, whereas the electricity output in MWh.

According SEWRC, there are three type of HPP – large (with installed capacity greater than 10 MW), small (with installed capacity ranging from 200 kW up to 10 MW) and micro (with installed capacity less than 200 kW) (Dnevnik 2011b). Regardless of their size, each hydroelectric power plant generates electricity through the equipment described below.

Each HPP needs a water source in order to operate. Depending on their type, the HPPs are supplied with water from various facilities as a reservoir and pondage (Raghunath 2009, Raja et. al. 2006). The water from the reservoir / pondage is transmitted to the turbines of the HPPs via a penstock or derivation channel. The water flow from the penstock strikes the turbines which, using a generator, generate electricity. The generated electricity is transmitted to electric transformers where the electricity is converted to high-voltage electricity current and fed to the gird (Raja et. al. 2006).

The capital expenditures for 1 MW of HPP installed capacity are approximately EUR 2.5 million[11]. The operational expenditures vary and depend on the system components which have to be substituted during the course of operation of the power plant. The hydro power is the most widely used renewable energy source in Bulgaria with projects with total installed capacity of about 1.9 GW of large-scale and 241.4 MW of small-scale HPPs which represent 81.5% of the entire pool of renewable energy projects constructed and operating in Bulgaria (Ministry of Economy, Energy and Tourism 2011). According to SEWRC, only the electricity generate by small-scale HPPs is subject to a purchase for a mandatory by law off-take period at a pegged FIT. As per the latest RESA, the off-take period for electricity generated by hydro energy remained at 15 years. In addition, the latest FIT for electricity generated by hydro energy determined by SEWRC is on average 4% greater than the last year's one. This data represents the stability of the hydro sector in Bulgaria. However, one of the major issues related to the hydro sector in Bulgaria is that there is not a big number of available hydro projects on the market as the hydro industry in Bulgaria was developed about a century ago and on the locations with the greatest capacity of hydro power are already occupied.

4.3.1.4. Biomass Energy

The major deference between a biomass power plant (**"BPP"**) and the other type of RES is that the former demands a particular feedstock in order to operate. The feedstock ranges from wood and

[10] Based on a commercial offer for the construction of a wind power plant in Bulgaria
[11] Based on a commercial offer for the construction of a HPP in Bulgaria

agricultural residues, up to organic and animal substances (SEWRC 2011). Even though a BPP generates not only electricity, but also heat and fuels, according to SEWRC (2011) only the electricity has to be purchased at a preferential FIT for a fixed off-take period. The installed capacity of a BPP is measured in MWe and MWt, where the "e" and the "t" stand for respectively electrical and thermal power. The output of such energy projects is measured in MWh.

There are various bio- and techno-mechanical manners for generating of electricity from biomass, including combustion, gasification, pyrolysis, fermentation, and anaerobic digestion of biomass (McKendry 2001). Each of these is a complex technical process which will not be explained in this study as answering the main research question does not depend on the technology employed in a BPP.

The capital expenditures of 1 MW of BPP installed capacity are about EUR 3 million[12]. The operational expenditures are approximately EUR 400, 000 per MW and depend on the system components which have to be substituted during the course of operation of the power plant and the feedstock required by the power plant in order to operate. According to Bulgaria's Energy Strategy by 2020, the technical potential of the biomass energy available in the country 17.2 TW of installed capacity, making the sector the RES with the greatest potential in the country. However, as of the end of 2010, there are only 3.5 MW projects of installed capacity generating electricity from biomass (Ministry of Economy, Energy and Tourism 2011a, Ministry of Economy, Energy and Tourism 2011). According to the latest RESA, the off-take period for electricity generated from biomass increased from 15 to 20 years. Furthermore, the latest biomass FIT announced by SEWRC are on average with 6% greater than the last year's ones. This additional stimulus was promulgated with the purpose of attracting foreign and local investors to devote their capital to biomass energy projects (Dnevnik 2011c). The main issue of a biomass project is that it depends on the supply of feedstock form 3rd parties. Owing to the local socio-cultural factors, this is a particular issue for Bulgaria where a foreign investor may become a "hostage" of a supplier constantly increasing the prices of the feedstock.

The following section looks into the main market forces which determines the development of the 4 RES sectors already analyzed.

4.4. Bulgarian RES market analysis

The aim of this section of the paper is to look into the Bulgarian RES market and provide a foreign investors' with an overview of the main market forces which shape the industry. This part of the research will provide a snapshot of the Bulgarian RES market using the Porter's (2008) Five Forces Model and consider factors as the bargaining power of the suppliers and customers, threat of new entrants and substitute products and the overall competitiveness of the market.

4.4.1. Threat of new entrants

In order to consider the threat of new entrants, the research will look into the Internal Rate of Returns (**"IRR"**) Bulgarian RES projects. The logic behind this adjustment of the Porter's model is that the higher the IRR levels of an invest opportunity are, the greater the threat of new entrants to the market will be (HM Treasury 2007). As there are not any empirical data on the financial results of already operational power plants in Bulgaria, the research had to rely of interviews and commercial offers to determine the industry's IRR levels. According to Mr. Toma Nedyalkov, depending on type of RES, the IRR level of renewable energy projects in Bulgaria varies from 12.5% to 30%[13]. His claim is further supported by Mr. Vladimir Alitchkov and Mr. Vladimir Vladimirov who state than the IRR on RES investments in Bulgaria, in particular those in the biomass segment could reach up to 33%. In comparison the average value of IRR of the S&P 500 for the period 1993-2003 was 10.2%, returns considerably lower than the ones which could be achieved with RES project investments in Bulgaria (Anderson et. al. 2006).

[12] Based on a commercial offer for the construction of a BPP in Bulgaria
[13] The suggested IRR levels are calculated based on the entire off-taker period of a RES power plant: 12 years for wind energy, 15 years for hydro energy and 20 years for biomass and solar energy

4.4.2. Threat of substitute products

Regardless of the advantages of RES power plants described in Chapter 4.1, there are also a lot of disadvantages related to them. First of all the initial capital investment is relatively high. For instance, the capital expenditures for the construction of 1 MWp installed capacity of solar park are approximately EUR 2 million – 2.5 million, in comparison the capital expenditures per 1 MWe installed capacity of a coal fired power plant is EUR 1.4 million (Huang et. al. 2011). Furthermore, the generation of electricity from RES power plants is not constant as the sunlight, speed of wind and rainfalls filling water reservoirs of HPPs are not manageable and foreseeable. Moreover, the electricity generated by RES power plants cannot be stored, hence once electrical current is generated by such power plants it has to be fed directly to the grid. However, if at this point of time there is not a demand for electricity, the investor will endure losses as the electricity will not be supplied to the grid, hence it will not generate cash flows. Last but not least, a RES power plant cannot be constructed everywhere as not every place on Earth has solar, wind, hydro and biomass capacity for the generation of electricity by the respective type of power plants (Mayo Country Council 2011, Melbourne Energy Institute 2011). Due to the above reasons, regardless of the directives supporting the development of RES power plants in Bulgaria, the threat of substitutes from fossil fuels power plants is rather high as they do not have any of the aforementioned issues related to the electricity generation process. Moreover, according to Rubin and Rao (2007) for the last years significant R&D efforts have been devoted in conventional power plants technologies in order to make them more efficient, lower-cost and CO_2 emission friendly. Owing to these reason, the treat of substitutes for RES power plants is rather high.

4.4.3. Bargaining power of suppliers

Owing to the fact that the PV modules and wind turbine are on average respectively about 50% and 80% of the capital expenditures related to the construction of the overall power plants from the respective RES type, it could be assumed that the bargaining power of the suppliers in this industry is rather high (Melbourne Energy Institute 2011, European Wind Energy Association 2011). In addition the 4 biggest manufacturers of these solar and wind system components have a market share of respectively 30% and 76%, an additional indicator for supliers' bargaining power over the developers of RES power plants (Renewable Energy 2010, Merrill Lynch 2007). However, as the RES sector becomes a lucrative and profitable market with an increasing number of market players, in the future the bargaining power of suppliers in the industry is expected to decrease.

4.4.4. Bargaining power of buyers

Every private and commercial consumer demands energy. As already described, according to the Bulgarian legislation, the electricity generated by RES power plants has to be purchased at a fixed FIT (State Gazette 2011). In Bulgaria, it is the end consumer who pays a green energy supplement to his electricity bill in order the FIT to be covered (SEWRC 2007). According to the latest energy prices, the end consumer has to pay a green energy supplement of EUR 0.0019 for each kWh of consumed energy (CEZ 2011). Furthermore, according to Nitzov et. al. (2010) the energy market in the country is still not liberalized meaning that the population cannot freely chose the EDC which will supply it with electricity. On the contrarily, in an open electricity market as the Dutch one, the people can chose between one of the 3 main EDC - Eneco, Nuon and Essent (van Damme 2005). Due to this Bulgarian specific legislation and the energy needs of the end consumer it can be assumed that they have a limited bargaining power over the producers of green energy.

4.4.5. Rivalry among existing competitors

According to Porter (2008) the rivalry among competitors is high when the industry presents substantial exit barriers. In case of RES power plants, the exit barriers are significant due to the fact that the assets utilized for the electricity generation are highly specialized and they cannot be used for other purposes rather energy generation. In addition, the salvage value of the RES system components is insignificant in comparison with their market price – for instance the salvage value of PV modules is with 400% lower than their market price (McCabe 2010, Melbourne Energy Institute 2011). In addition, due to the low entry barriers as evident by the RES stimulating incentives undertaken by the Bulgarian government, the low bargaining power of the customers and the significant threat of new entrants, it can be assumed that the rivalry among the existing competitors in the RES sector in Bulgaria is relatively high.

The rivalry in the case of the RES industry does not have the same sense as per Porter (2008). In this sector the competitors cannot enter in price wars and offer discounts due to the fixed FIT and price of electricity regulated by SEWRC, they do not have to start marketing campaigns or aim at improving their customer services as electricity is a commodity of first necessity. Therefore, in the case of the green energy industry, the rivalry among competitors mainly consists of competition for identification and procurement of eligible RES projects, i.e. projects located in an area with substantial capacity of the natural resource they need to operate, possessing all the required documents for their construction and connection to the grid and situated in a location with enough grid capacity to intake the electricity generated from the power plant.

Some of the big companies who have entered the Bulgarian RES industry in the last years are companies as CEZ a.s., EVN, AES, Toshiba, Mitsubishi Heavy Industries, Hanwha, EDF, Alpiq, EnergoPro and GDF SUEZ. All these investors have in common that they are multi-million multinational companies with experience in the energy sector. They can be segmented based on their origin on European, North-American and Asian companies. According to Mr. Andrey Bachvarov, the entire pool of foreign investors active on the Bulgarian RES market could be clustered into 3 groups - institutional, strategic and private equity fund investors. The major differences between these groups are their motivation to invest and the risk tolerance level they are willing to put up with. The institutional investors are least risk-tolerant as they are looking for risk-free investment opportunities in order to diversify their portfolios. The strategic ones in most cases are producers of RES technology. Their risk-tolerance is higher than the institutional investors' one as their motives are not only to generate revenues from the RES power plants, but also to established their positions as a manufacturer on the respective market. Last but not least, the private equity funds are the ones with the highest level of risk-tolerance as their main motive to investment is to maximize the returns on the invested capital. Regardless of their risk tolerance, each foreign investor would require a set of eligible models and tools applicable to the Bulgarian RES environment, which would allow him to evaluate the eligibility of a given investment opportunity.

4.5. Tools and strategies for enhancing the foreign investors' returns

The following section provides a set of tools and methods which could be used by BICA when the company assists to the foreign investors in their efforts to enhance the returns on their capital invested in renewable energy projects in Bulgaria. These tools are split to three different stages. The first stage encompasses pre-investment profit enhancing tools which look at the riskiness, financial analysis and subsidies which could enhance the returns of a given RES investment opportunity. The second stage looks into tools as equity refinancing and investment exit strategies which could be considered when a RES investment opportunity has been constructed and put into operation. The final stage considers two techniques which could be implemented when the fixed by law off-take period expires and a given RES power plant has to compete with fossil fuels power plants on the energy market.

4.5.1. PRE-INVESTMENT PROFIT MAXIMIZATION TOOLS

According to Pike and Neale (2006) in order an investor to maximize the returns on his invested capital, an investment opportunity should be examined from a strategic, marketing and financial perspective. In the section outlined below, applicable for the Bulgarian market profit enhancing tools, from each of these domains will be presented to the reader.

4.5.1.1. Risk evaluation tools

According to Mr. Theodore Tsacheff, there are various macro and micro risks pertaining to a Bulgarian RES investment opportunity. As Mr. Tsacheff claims, all these risks may inhibit the returns on the investors' capital. Therefore, for the sake of providing the foreign investors with a macro overview of the risks pertaining to a RES investment opportunity, this study will considers a Political, Economic, Social and Technical (**"PEST"**) analysis on the Bulgarian RES industry.

PEST Analysis

According to Forbes et. al. (2008) the PEST analysis provides an eligible framework for assessing the risk environment of a given investment opportunity on a macro level. The author further claims that in order a foreign investor to determine whether he is are ready to cope with such a risk environment, he should be familiar with the country-specific political, economic, social and technical parameters which shape the sector of the targeted investment opportunity.

Political factors

The political factors are often a leading factor when an investor determines whether to invest in a particular country. These are specifically sensitive for an emerging economy as Bulgaria where the government does not have a regulatory role but still plays a major market-shaping function (Iankova and Katz 2003). Furthermore, according to Mr. Vladi Vladimirov the legal system in the country, which is still in a process of reformation and various amendments, allows for speculative RES market[14] which could significantly affect the foreign investors' returns. In addition, Mr. Vladimir Alitchkov assumes that the lobbying and RES related social attitude in the country predetermine the development of the sector.

According to Nitzov et. al. (2010) the Bulgarian energy market is considered as highly regulated. The authors claim that the State institutions significantly affect the development and the market dynamics of the sector. The RES segment, as part of the energy industry is not an exception. The two leading institutions which shape the outlook of the segment are the Ministry of Economy, Energy and Tourism ("**MEET**") and State Energy and Water Regulatory Commission (**"SEWRC"**). The role of the former is to shape and grant the legal framework aimed at stimulating the RES sector in Bulgaria in order the country to reach its target of 16% green energy from the overall energy mix by 2020. Recently, MEET introduced the Energy Strategy of Bulgaria by 2020 which states that the biomass RES segment is the most unutilized one in Bulgaria (Ministry of Economy, Energy and Tourism 2011a). In order to stimulate the development of this sector and to balance the current boom in the solar one, the government changed the mandatory by law off-take periods for electricity generated by RES power plants as per the newly promulgated Renewable Energy Sources are presented in Graph 2.

SWERC, the other leading institution in the Bulgarian RES sector determines the overall prices of electricity in the country and the FIT at which the electricity generated by green power plants will be purchased by the EDCs in Bulgaria or the NEC (if a project is with installed capacity up to 5 MW it falls in the jurisdiction of the EDC; if greater than 5 MW it falls under the jurisdiction of NEC). An analysis of the fluctuations of the FIT for the last 3 years follows.

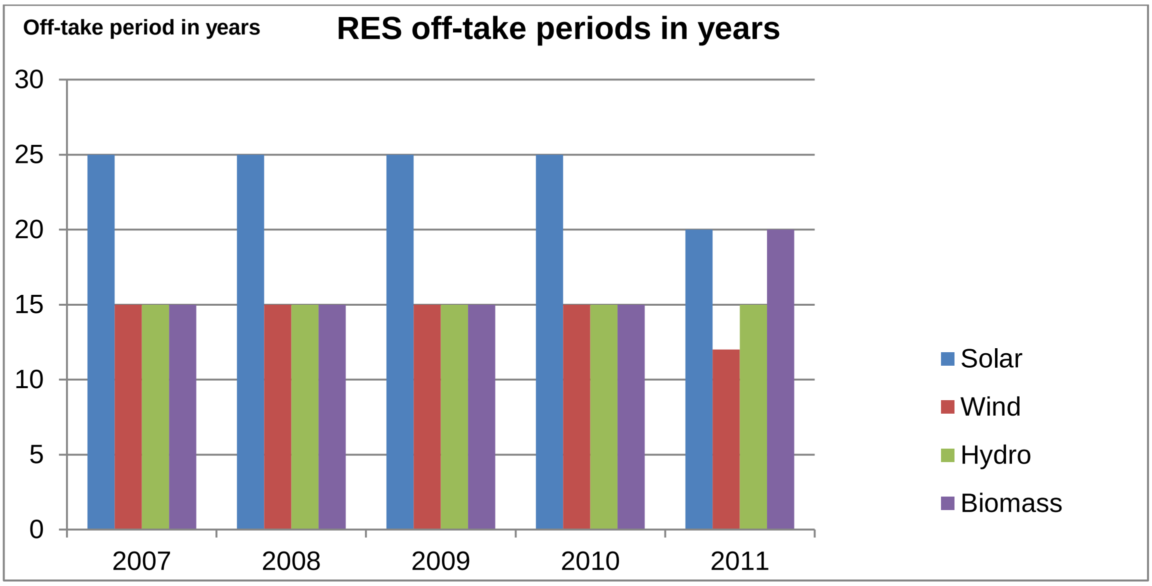
Economic factors

Each year SEWRC determines the level of FIT. As SEWRC (2011) states they are determined based on factors such as:

- Assets lifetime;
- Depreciation costs;
- Project expected IRR;
- Capital and operational expenses;
- Inflation rate of the operational expenses;
- Cost of external capital;

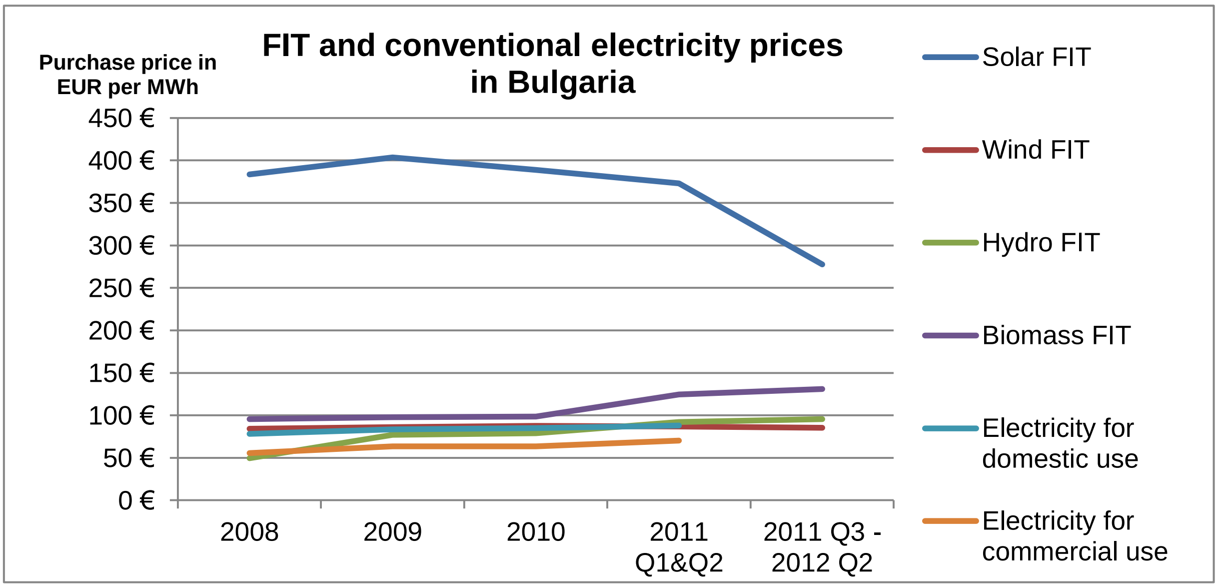
Following these parameters, each year SEWRC calculates the FIT for the relevant type of RES power plant (*Graph 3*).

[14] In Bulgaria there is a substantial number of developers of RES projects which buy a land plot, sign a grid connection contract with one of the EDC or NEC and issue a construction permit. In turn, they offer this package of land and documents as a RES investment opportunity without taking any due diligence whether the project can be constructed and put into operation. Owing to these reason there are a lot of speculative projects offered on the market, hence the market is considered as speculative



Graph 2. Off-take Period for the Solar, Wind, Hydro and Biomass Power Plants

Source: Renewable Energy Sources Act (2009) and State Gazette (2011)



Graph 3. FIT for the 4 Main Types of RES and Market Price of Electricity in Bulgaria

Source: SEWRC (2009), SEWRC (2010), SEWRC (2011a), National Statistical Institute (2011) and Energy (2011)

Additional economic factor which should be taken into account by the foreign investors are the grid connection fees. According to the latest Renewable Energy Source Act (**"RESA"**), each investor has to pay EUR 12, 500 per MW installed capacity of a RES power plant with installed capacity of up to 5 MW and EUR 22, 500 per MW for a RES power plant with installed capacity greater than 5 MW. The additional costs related to rehabilitation or construction of transmission lines and electric substations where the projects will be connected is also a responsibility of the investor (The State Gazette 2011). These costs are project specific and according to Mr. Toma Nedyalkov could vary substantially depending on the location of the project.

The FIT in Bulgaria is denominated in Bulgarian Lev (**"BGN"**). For an EU investor this may not be a significant risk as the BGN is pegged to the EUR at a rate of EUR / BGN 1.95583 (Bulgarian National Bank 2011). However, for a non-EU investor, this fact may impose a significant risk as the fluctuation exchange rates between the BGN and the foreign investor's home currency could fluctuate.

Social factors

According to Mr. Vladimir Alitchkov the social attitude towards the RES sectors in Bulgaria could substantially affect the course of development of the industry in the country. His suggestion is further supported by the fact that the common social opinion about the solar power plants in Bulgaria is negative due to the fact that the FIT for this type of power plants is the most expensive in comparison with the other types of RES power plants, hence, it gives the highest weight to the green supplement part of their energy bills (Dnevnik 2011d). Additional factor which affects the social opinion is the fact that the solar power plants demand highest amount of land for their construction – approx. 2.5 hectares per 1 MWp of installed capacity (Energy Review 2011). The later, couple with the fact than a number of PV power plants are being installed on agricultural land explains the fact that in May 2011 a new law in Bulgaria was promulgated which prohibits the construction of PV power plants on agricultural land from 1st to 4th category (Dnevnik 2011e). There is a similar attitude towards the wind energy as the turbines could endanger the migration of the bird herds during the spring and autumn seasons. In addition, when the turbines operate they create a noise which disturbs the inhabitants in proximity (Dnevnik 2011f). On the contrarily to the above negative opinion about the respective RES sectors, the biomass segment has a relatively positive opinion among the society as the biomass power plants utilize agricultural residues and animal feces which are a burden for the farmers as according to the European legislation they have to be collected, stored and destroyed by the farmers under stringent rules (Parliament 2011).

Technological factors

Owing to the boom in the Bulgarian RES sector, there are various local companies which have taken advantage of this green trend and decided to enter the industry. Companies such as BG Solar Panels, GLB Bulgaria, MAT Bulgaria and International Power Supply manufacture the essential for each PV power plant system components as mounting structures and PV modules (Energy Review 2011). In addition, owing to the Bulgarian traditions in the hydro sector, companies as VAP Hydro have already established their position on the local and international market of hydro turbines. Furthermore, the Bulgarian significant heritage in the electricity industry has fostered the presence of local companies and industry experts specialized in the development of grid connection and general electric equipment. Last but not least, some of the leading European Engineering, Procurement and Construction (**"EPC"**) companies, which design and construct RES power plants on a turn-key basis, have established their positions on the Bulgarian RES market. The above implies that the local industry is developed well enough to mitigate any potential technical risks which may occur during the construction and operation of a RES power plant in Bulgaria.

Once the macro environment of the RES sector in Bulgaria has been clarified, this study will look into an optimal model which examines all the relevant micro risks pertaining to a set of RES investment opportunities for the sake of identifying, analysing and potentially mitigating them in order the returns of the foreign investors to be secured and enhanced.

The Analytical Network Process Tool

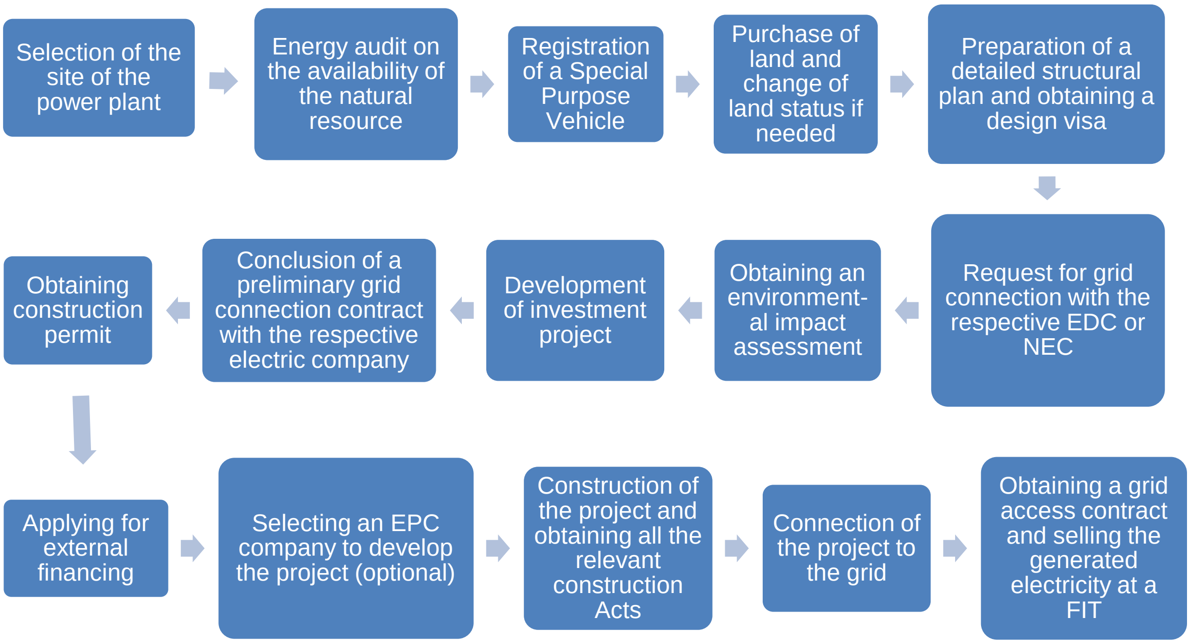
Aragone´s-Beltra´n et. al. (2010) claim than one of the most commonly used and efficient techniques for assessment of the eligibility of a RES investment opportunity is the Analytical Network Process ("**ANP"**) model as presented by Saaty (2001). The ANP is a tool which breaks down the decision-making process pertaining to a given RES investment opportunity into several levels, allowing an investor, given a large pool of investment opportunities, to sort out the ones which are the least risky and complicated for development.

The ANP analyzes an investment opportunity in three different stages: problem analysis, data synthesis and evaluation of results.

As per the ANP model, during the problem analysis stage the investor should formulate the end goal of his undertaking and invested capital. Following the research topic of this paper, the question which the investor should formulate on this stage is as follows:

"Of the entire pool of identified and presented investment opportunities, in which of the projects should be invested in order a maximum return to be attained?"

Once the end goal of the investor's undertaking is elucidated, a clear picture and description of the entire process for the development of the investment should be composed. The diagram outlined below is an indicative sample of the steps related to the development of a RES power plant as proposed by the ANP model. Following the interviews with the 5 industry experts which participated in this study, this model has been adjusted to the Bulgarian RES sector environment. Depending of the type of RES project this diagram may be subject to further amendments.



Graph 4. Outline of a Project Development in Bulgaria

Sources: Aragone´s-Beltra´n et. al. (2010) and Interviews

The process related to the development of a RES power plant is rather complex and consists of various steps (*Graph 4*). Each of these steps is related to a number of risks which may damage the returns of the foreign investors. In order such an event to be avoided, the ANP model suggest that all the relevant risks pertaining to an investment opportunity to be listed and clustered in groups (*Table* 1). Following the 5 conducted interviews with local industry experts who participated in this study the model has been adjusted to the Bulgaria RES sector environment.

Main Cluster	Sub-cluster	Specific Risks	
Political risk	Macroeconomic risk	A1	Changes in energy policies and FIT
		A2	Imposing additional taxes on the electricity generated by RES power plants[15]
		A3	A new government which ceases the support of the RES sector

[15] An example for such a risk is the recently imposed in the Czech Republic retrospective 26% tax on revenues from PV power plants (Renewable Energy Focus 2010)

	Urban planning	A4 Urban planning approval is subject to decision by a local authority A5 Issuance of construction permit is subject to approval by the City Council or the Mayor
Technical risk	Related to the power plant location	A6 Climate change which may damage the RES technology generating electricity A7 Flooding risk in the area of the power plant A8 Availability of the natural resource A9 Geodesy and geology properties of the land plot A10 Grid capacity of the area of the power plant
	Technology related risk	A11 Selection of an appropriate for the project's location technology A12 Selection of the grid equipment appropriate to the local specific electricity network A13 Potential need for rehabilitation of the grid which may increase the project construction costs
	Availability of feedstock in the area (applicable only for biomass)	A14 Risk of not being able to sign a concession long-term contract for the supply of feedstock which is prerequisite for a biomass power plant in order electricity to be generated
Economic risk	Associated with the power plant exploitation	A15 Power plant higher than forecasted operational costs A16 Power plant higher than forecasted maintenance costs A17 Performance losses which may decrease revenues
	Related to power plant location	A18 Capacity of the natural resources in the area A19 Climate change which may decrease the electricity generated by the power plant A20 Additional costs related to the preparation of the land plot for construction of the project A21 Additional costs related to a drainage system for flood preventions A22 Additional costs related to the rehabilitation of the grid in the area of the power plant A23 Additional costs related to construction of an access road to the power plant's site
	Related to the power plant start-up permits	A24 Costs for connection of the power plant to the grid[16] A25 Soaring costs for the acquisition of the land plot with high potential of natural resource A26 Potential need for construction of the transmission line from the power plant to the grid connection point A27 The City Council may have additional monetary requirements to the investor before issuing the construction permit
	Related to technology	A28 Costs due to inadequate selection of RES technology
	Macroeconomic	A29 If the perceived project risk is too high, there might be an issue with applying for bank financing A30 Decrease in electricity demand, hence diminishing cash flows A31 Increase in inflation rates[17] A32 Decrease in FIT A33 Depreciation of the BGN A34 Economic recession which makes the government to make budget cuts as for instance support of the RES sector

[16] As per the new RES: 12, 500 per 1 MW installed capacity for a power plant bellow 5 MW and 25, 000 for 1 MW of a power plant with installed capacity above 5 MW

[17] The FIT in Bulgaria is not indexed to the inflation rate, therefore an increase in the inflation rate will decrease the real value of the cash flows to be generated from the operation of the power plant

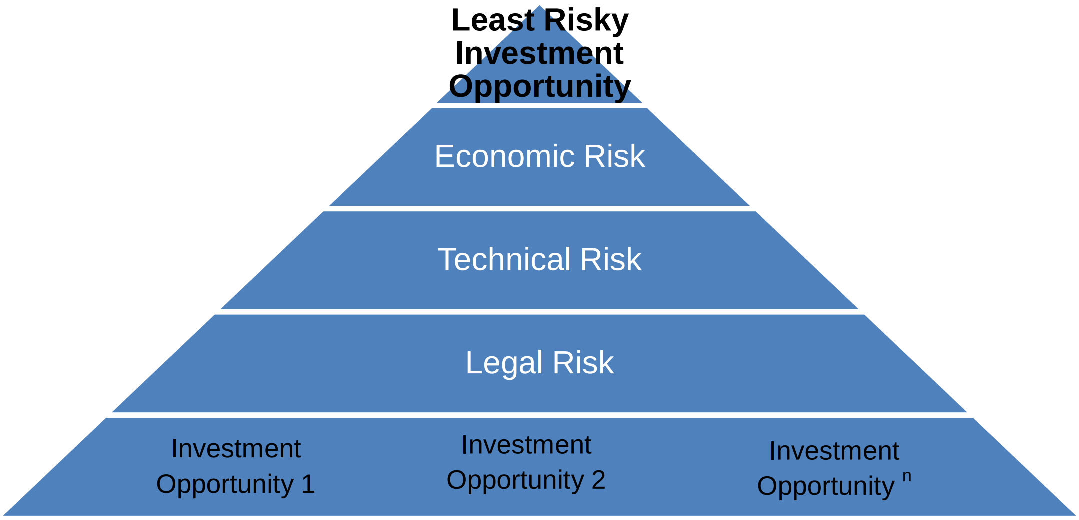
Time delay risks	Connection to the grid	A35 Prolonging the planned connection of the project to the grid, hence forgoing cash flows resulting from selling the electricity A36 Delays in the permit for laying the cable line connecting the project to the grid A37 Delays in receiving the Act allowing for putting the power plant into operation A38 Delays with signing of the grid connection contract and grid access contract with the EDC or NEC
	Urban planning	A39 Delays in receiving the approval for the construction of the power plants from the local authorities A40 Delays in obtaining the environmental permit allowing for the construction of the power plant A41 Delays in receiving the construction permit authorizing the building of the power plant
Legal risks	Related to legal issues	A42 Inconsistencies among the legal framework of all the municipalities in Bulgaria, complicating the construction of a RES power plant A43 Changes in the legal framework inhibiting the development of RES power plants in Bulgaria A44 Legal proceeding against the SPV holding the project rights of the identified investment opportunity
	Legal risk related to the connection of the power plant to the grid	A45 Change in the legislation which may inhibit the connection of the project to the gird; A46 Inconsistencies among the districts in Bulgaria which may inhibit the issuance of the act by the regional construction supervision authority
	Permitting risk	A47 The identified investment opportunity does not have all the permits required for construction of the project A48 The identified investment opportunity does not have all the required documents related to the connection of the project to the grid
	Urban planning related	A49 Changes in the local legislation which may make the urban planning void A50 Changes in the local legislation which may endanger the development of RES power plants in Bulgaria
Social risks	Related to the power plant	A51 Due to the boom of the RES sectors in Bulgaria, there is a substantial number of speculants which may offer projects that are not viable A52 Threat of theft of system components from the power plant A53 Threat of vandalism and damage of the power plant A54 Risk of becoming a "hostage" to the supplier of feedstock who may demand high prices for the respective resource (applicable only for biomass projects)
	Urban planning related	A55 Social disapproval of the development of the power plant

Table 1. Major Risks Associated with the Development of a RES Power Plant in Bulgaria

Sources: Aragone´s-Beltra´n et. al. (2010) and Interviews

After all the relevant risks related to the development of a RES power plant have been identified, Aragone´ s-Beltra´n et. al. (2010) claim that an investor should give a weight to each of the identified risks and based on them each of the investment opportunities which has been already sourced should be assessed. There are two modes by which this evaluation could occur – the hierarchy and the network model.

As Aragone´ s-Beltra´n et. al. (2010) states the hierarchy model ranks in a hierarchy manner, starting with the entire pool of identified RES projects, followed by up to 3 of the most relevant risks related to these projects and at the top, the end goal of selecting the least risky project. This hierarchy, considering the 3 main risks related to RES energy projects in Bulgaria[18], could be presented using Graph 3. According to Mr. Nedyalkov the hierarchy model is a good technique for pre-screening of a large pool of investment opportunity. It could be used in order a given number of projects to be shortlisted and further analysed.



Graph 5. Analytical Hierarchy Process for Evaluating a RES Investment Opportunity

Source: Aragone´s-Beltra´n et. al. (2010) and Interviews

According to Aragone´s-Beltra´n et. al. (2010) the investor himself, using the assistance of various questionnaires listing all the relevant risks pertaining to a RES project and ranking them on a scale from 1 – 9, should opt for the risks to be included in the hierarchy. However, for the sake of enhancing the foreign investor returns, Mr. Nedyalkov suggests that this process should be performed by BICA as the company has a better insight about the relevant risks pertaining to a RES investment opportunity in Bulgaria.

The hierarchy model is an appropriate tool for investment opportunities pre-screening and shortlisting the ones which at least risky from a pre-analysis point of view and do not have crucial problems which make them unfeasible. In order a deeper analysis of the investment opportunity to be implemented, Aragone´s-Beltra´n et. al. (2010) suggests than an ANP should be performed on the shortlisted investment opportunities. Due to the fact that an ANP analysis required a detailed knowledge about the local market and RES specifics, it is advisable such an analysis to be performed by BICA. The ANP provides a feasible interconnected network between all of the identified risks. In order such a network to be compiled, first of all, the model requires all the relevant risks pertaining to the development of a RES project to be identified and grouped in clusters (*Table 1*). In turn, the investor should determine if a given individual risk from one cluster has influence on another risk from the same or different cluster. This process is performed by a table which lists all the identified risks on its X and Y axis. In turn, the investor marks which of the risks from the X axis have an impact to the ones listed on the Y axis. After this connection has been made, the investor receives a clear view which risks have most influence on the other risks identified - an example for such a case would be that a technology risk of system component breakdown would influence economic risks such as higher than expected operational costs and decreased revenues streams from the RES power plant. After the most influential risks and clusters have been identified, the investor, using the assistance of questionnaires similar to those used in the hierarchy model, determines the weight of the given risks. In turn, using the related weights of the identified risks, each of the identified investment opportunity is examined and the ones which have the least risky scores

[18] According to Mr. Vladimirov and Mr. Nedyalkov these are the three main risks which are relevant to the pre-screening of a given RES investment opportunity in Bulgaria

should be a subject of a financial analysis in order the most feasible project to be acquired, securing a maximum return on the funds invested in the development of the respective project.

In addition to the ANP model, other 4 models have been considered as a viable tool for assessing the riskiness of a given investment opportunity. Table 2 below provides a cross-comparison analysis of each of these models. Furthermore, it lists all the pros and cons pertaining to each of the 5 models and gives a rationale why the ANP model was selected over the Axiomatic Design, VIKOR, EMERGENCE and Top-down approach models.

Model	Advantages	Disadvantages	Rationale for (no) opting for the model
Analytical Network Processing ("ANP") Model	• Provides a set of risks for evaluating a RES project • The identified risks are applicable for the Bulgarian RES sector • Provides a clear connection between all the identified risks and weights their importance • The eligibility of the models has been confirmed by practitioners[19]	• The presented model has been consider only for evaluating PV projects • The presented model has been developed using the Spanish RES sector • The identifications of the risks is a complex and time consuming process which demands an in-depth local knowledge	• The model was selected as from the options outlined in this table it is the one which most accurately presents all the local-specific risks related to the development of a RES power plant in Bulgaria
Axiomatic Design Model	• It considers the Analytical Hierarchy Process model, part of the ANP model • It considers the various stages and both internal and external factors which influence the development of a RES power plant • Provides a weight to the most influential risks	• The model is elaborated only for the Turkish RES sector • It outlines only the 4 main clusters and 17 sub-categories of risks • It relies solely on a hierarchy ranking process of the risks	• The model was not selected as it does not make a correlation between all the identified risks and is developed solely for a non-EU country, hence it might not be applicable for the Bulgarian RES sector
VIKOR Model	• It considers both financial and strategic factors when a project is examined • It uses clearly defined mathematic formulas and algorithms when the projects are assessed	• It does not identifies any potential risks related to the development of a power plant • It excessively concentrates on formulas and neglects local specifics	• The model was not opted as it emphasizes only on the mathematic side of an investment and forgoes the "soft" factors as risks
EMERGENCE Model	• It considers various financial, macroeconomic, technical and local specific factors upon evaluating a RES power plant	• It considers only the barriers to entry but not the risks related to the investment opportunity • It is developed solely for evaluating wind projects in Greece	• The model was not selected as it provides only the barriers for the development of a RES power plant but not the risks
Top-down Approach	• It considers the theoretical, technical and economic potential of a given investment opportunity • It considers each of the main type of RES – solar,	• It does not provide a clear overview how the development of an investment opportunity looks like • It does not pinpoint the risks pertaining to the	• The model was not selected as it is too scientific and its implementation in real business cases could be limited

[19] Mr. Vladimir Alitchkov confirmed that during the course of consulting the development of more than 70 MWp PV projects in Bulgaria, he identified most of the risks mentioned in the model

	wind, hydro and biomass	construction of a RES power plant • It concentrates solely on the potential of an investment opportunity but not its feasibility	

Table 2. Potential Models Cross-comparison

Source: Aragone´s-Beltra´n et. al. (2010), Kahraman et. al. (2009), Cristóbal (2010), Oikonomou (2009), Angelis-Dimakis (2009)

After the ANP is performed and the least risky investment opportunities selected, this study will look into a viable financial tools which examines the economic feasibility of the shortlisted projects.

4.5.1.2. Financial profit maximization tools

As per Bigham and Ehrhardt (2010) the major method for evaluating an investment opportunity and determine if it will bring profit maximization to the investor is to use financial analytical tools. This section outlines the financial tools which were considered for achieving the main goal of this research and analyzes the one which was opted for as the most applicable for a RES investment opportunity.

Real Options Evaluation Model

According to Kumbaroğlu et al. (2006) one of the most applicable financial tools for assessing the feasibility of a given RES investment opportunity is the Real Options Valuation (**"ROV"**) model. The authors further claim that one of the main advantages of the ROV model is that it takes into account the time period as of when an investment will be made. The authors examine the difference between the scenarios outlined in a typical Capital Budget - invest at time *t* and receive a return equal to the revenues minus costs discounted with the respective factor. On the other hand, a ROV model looks into the option of waiting and investing at a point *t+1* and taking advantage of a real option which may occur in the future. An example for a real option is decreased prices of RES technology and increased FIT. This model could be represented by the following formula:

$$Et(NPV) = max\ u_t \left\{ \pi_t(u_t) + \frac{1}{1+p}\ Et\ (NPV_t{+}1) \right\}$$

As per the formula outlined above, an investment in time period u_t brings immediate revenues of π_t. However, if the investment is completed in the next time period *t+1*, then a real option may occur which will bring a NPV of $Et\ (NPV_t{+}1)$ discounted at a rate of 1 / (1+p). The optimal investment scenario will be the one which brings the highest returns. The ROV model allows for a comparison between if the investment is concluded "today" or "tomorrow" and provides more options to the investor in comparison the classical Capital Budget model which follows the concept invest "today" or "never".

The ROV model considers all the relevant items outlined in a Capital Budget, including costs for the acquisition of the investment opportunity, capital and operational expenditures, depreciation costs, taxes, revenues, salvage value and discount factor. However, the ROV model compliments the Capital Budget one by incorporating various RES specific factors as lead times for the construction of the power plant, demand for electricity, RES technology learning curves and decreasing costs, as well as surging fossil fuels and energy prices and their effect on the RES power plant. The logic behind incorporating these factors in a classical Capital Budget is to consider their real effect on the returns a given investment opportunity. An example why the lead time would be considered as an influential factor would be the case if an investor procures an investment opportunity in September and decides to commence construction works on the power plant in October. However, due to the Bulgarian specific weather constraints, the lead times may take longer than expected and operational costs such as wages and rent for equipment to be higher than initially forecasted, hence, decrease the returns on investment. Another factor considered by the ROV model for a RES power plant is the demand for electricity and its elasticity. According to the World Bank (2011), the electricity consumption in Bulgaria increased from 2001 to 2008 by approximately 17.6% and it is expected to further grow in the future. In addition, Nitzov et. al. (2010) claim that the energy market in the country is still not liberalized meaning that the population cannot freely chose the EDC which will supply it with electricity. On the contrarily, in an open electricity market as the Dutch one, the people can chose between one of the 3 main EDC - Eneco, Nuon and Essent (van Damme 2005). This implies that since the electricity is a commodity of first necessity, in Bulgaria the increase in energy prices could be easily passed on to the consumers, therefore, increase the revenues of a given power plant. Last but not least, the technology plays a crucial role in determining the returns of a given RES power plant as it contributes approximately with 80% of the overall development costs. According to Melbourne Energy Institute (2011) due to the current boom in RES technologies and the relatively flat learning curve in the industry, the RES technology is expected to drop in prices by approximately 10% per annum. Such a drop in prices could substantially enhance the returns on the investors' investments.

All the factors outlined above could have both a positive and negative effect on the foreign investors' returns. In order the exact numerical influence to be measured, Kumbaroğlu et al. (2006) suggests that the historical trends of each of the parameters to be followed and studied. In turn, the scholars assume a number of mathematical algorithms to be incorporated in the ROV model and various investment scenarios to be examined in order the one offering the maximum value of a project's Net Present Value (**"NPV"**) determined and opted for. This would assist the investor with the decision-making process when an investment should take place – "today" or "tomorrow". This evaluation demands a more detailed descriptive analysis of the above parameters which is a subject to a different research topic. Therefore, for the sake of looking into the main topic of this research, this in-depth analysis will be omitted. If interested, the foreign investors could use commercial software as Crystal Ball® which performs ROV analysis.

This study looked into 4 financial analytical models for the sake of employing an eligible financial tool for the selection of an investment opportunity which will enhance the returns of the foreign investors' capital. Table 4 below lists the pros and cons of each of the considered models and gives a rationale why the Real Options Valuation model was selected over the Capital Budget, Marginal Efficiency of Capital and Risk-profitability Matrix models.

Model	Advantages	Disadvantages	Rationale for (no) opting for the model
Real Options Evaluation Model	• Provides a financial analysis of an investment by complementing an already established model as the Capital Budgeting technique • Accounts for the time when an investment opportunity will be bought, constructed and put into operation • Considers the learning curve, change in prices of RES technologies and relevant risks related to the development of a project • Considers a "what-if" scenarios and the returns of investment if the construction of a project is delayed in the time • The eligibility of the model is confirmed by practitioners and cross-validated via literature sources	• Demands a large pool of information-intensive data as RES technology, fuel and electricity prices and demand • The usage of the model requires a special software different than the ones used for the development of a Capital Budget	• The model was selected as from the options outlined in this table it is the one which most accurately presents all the constantly changing parameters related to an investment opportunity and its construction in various points in time
Capital	• Already established and	• Does not account for the	• The model was not

Budgeting Model	well known financial instrument for evaluation of investment opportunities • Relatively simpler in comparison to the real options model • It does not demand a special software for its composition	RES specific factors which influence the feasibility of a given investment opportunity	selected as it does not considers the relevant risks and parameters of a RES investment opportunity
Marginal Efficiency of Capital Model	• It simplifies the selection of an investment opportunity by evaluating it based on 3 factors: (i) the price of the project and technology for its construction, (ii) the availability of the natural resource in the area where the project is located and (iii) the distance from the projects to its grid connection point	• The model oversimplifies the financial evaluation of an investment opportunity and does not account for additional costs which may arise during its development and operation	• The model was not opted as it lacks some of the essential elements relevant to the evaluation of a RES investment opportunity
Risk-profitability Matrix	• It makes a clear connection between the risks pertaining to a given project and its profitability	• It does not provide a feasible financial breakdown of all the costs and cash inflows pertaining to the development of a RES power plant	• The model provides a high-level of detail financial analysis which does not facilitate the decision-making process related to selecting a profit maximizing project

Table 3. Cross-comparison of Financial Evaluation Tools for Selecting Profit Maximizing Projects

Sources: Kumbaroğlu et al. (2006), Hermes et. al. (2007), Faundez (2007) and Dinica (2004)

Following the ANP and ROV analysis, the investor procures the least risky and most financially feasible investment opportunity. The next step in the profit maximizing “journey” for the investor is to identify feasible external capital which allows the investor to enhance the returns on his capital.

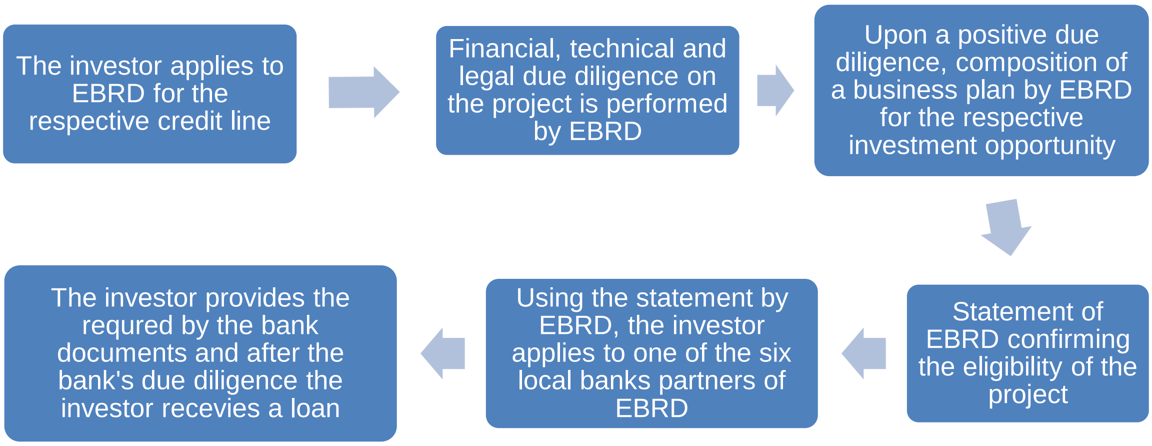
4.5.1.3. Local Financial Stimulus

As already discussed in Chapters 4.2 and 4.3, the Bulgarian and European authorities have offered a number of financial and administrative stimulus for the development of the RES sector in the country. These incentives are in the forms of subsidies, preferential credit lines and tax holiday option. Each of these additional and “free” financing instruments will be briefly discussed in the following section.

EBRD Credit Line

One of the incentives undertaken by the European Bank for Reconstruction and Development (**“EBRD”**) in regards to stimulating the development of the RES sector in Bulgaria is the Bulgarian Energy Efficiency and Renewable Energy Credit Line (BEERECL 2011). This line offers to the investor a loan of up to EUR 2.5 million, an incentive grant of up to 15% from the loan and free consulting services related to the development of a business plan for the exploitation of the investment opportunity.

In order an investor to apply and be approved for this credit line, he has to go through the following stages:



Graph 6. Scheme for Applying to EBRD Credit Line

Source: BEERECL (2011) and Interview with Mr. Vladimirov

Using this preferential credit line and the grant related to it, an investor could enhance its returns not only with the financial aspect of the subsidy, but also through the due diligence and the business plan developed by EBRD which add additional value and credibility to the project.

European Funds

Additional funds which could increase the returns on the investors' capital are the European funds offered to Bulgaria as a newly accepted member of the EU in order the RES sector in the country to be stimulated.

The first types of subsidies applicable to RES power plants are measures 311 and 312 part of operational programme "Development of the rural regions". These subsidies are tailored to PV power plants developed in the rural regions of Bulgaria. They finance up to EUR 200, 000 of the overall capital expenditures of the power plant (Ministry of Agriculture and Foods 2008).However, according to these subsidies the maximum capital investment of the project cannot exceed EUR 1 million, meaning that the total installed capacity of the power plant will not be greater than 500 kWp, a capacity which may not be intriguing for the target audience of this research.

The other type of subsidies which may be more intriguing for the target audience of the research is the operational programme "Energy Effectiveness" subsidized by the European Investment Bank. This programme allows for financing of public-private partnerships for the development of RES power plants (European Investment Bank 2011). From the one hand it is a good instrument for a foreign investor to establish his positions on the Bulgarian RES market by partnering with the local authorities who will mitigate some of the risks related to the development and operation of the project. In addition, the municipality could contribute to the investment non-cash assets such as land and concession rights for feedstock in the case of a biomass project. Furthermore, such an investment could foster the public image of the investor in the Bulgarian RES industry. On the other hand such a partnership will benefit the municipality and its inhabitants.

The formation of such an investment is beneficial for the two parties as the municipality could receive up to 100% financing and the investor could receive 10% grant of the entire amount of the debt financing of the project (Raiffeisen 2011). In addition, by incorporating the know-how of the investor and local knowledge of the municipality, the returns of the investment could be maximized. However, the main risk related to the development of a public-partnership is that there is not a clear regulatory framework which controls the formation of such partnerships in Bulgaria (Ministry of Economy and Energy 2007).

Tax Holiday

According to the Bulgarian Law for Corporate Taxation (2011) if an investment is made in a municipality with 35% unemployment rate higher than the country's average, the respective investor is entitled to a tax holiday. The current corporate tax rate in Bulgaria is 10% (Worldwide Tax 2011). There are currently 130 municipalities in Bulgaria which have an unemployment rate 35% higher than the country's average. Some of them fall in the regions with the greatest potential of solar, wind, hydro and biomass energy in the country (The State Gazette 2011a).

The prerequisites for obtaining a tax holiday are fairly simple and straightforward (The State Gazette 2011a). They are as follows:

- The SPV should be registered in one of the 130 municipalities having an employment rate 35% higher than the country's average;
- The SPV should have not received a tax holiday for the past 5 years;
- The SPV should not owe any duties to the State;
- At least 25% of the initial value of the investment should be financed by the investor's own equity;

By not paying the 10% on the revues generated by selling the electricity of the RES power plant, the investor could significantly increase his net income, hence the returns on investment.

4.5.1.4. External financing

A number of authors support the idea that the cost of equity is higher than the cost of debt (Gatchev et. al. 2008, Lai 2011, Gaud et. al. 2006). There are a number of reasons why equity is considered as a more expensive means of financing including opportunity costs, the investor bearing the entire risk of the investment and tax deductibility of the debt. Therefore, for the sake of avoiding those constraints related to an investment financed solely by equity, the authors suggest that an investor should consider external capital as a means of financing.

A number of European leading banks as UniCredit Bank, Piraeus Bank, Barclays and HSBC offer loans for financing the development of RES power plants. The interest rates offered by the banks in Bulgaria and the rest of the EU countries vary significantly. For instance, according to the Bulgarian National Bank (2011a), the average interest rate in the country for a period over 5 years and amount exceeding EUR 1 million is 12.68%. In comparison, the statutory interest rate as per the Bank of the Netherlands (2011) for July 2011 is 8.25%, a figure substantially lower than the one offered by its Bulgarian counterpart.

According to Duke et. al, (2009) leasing financing is an alternative to the fixed financing which may allow the investor to match the cash inflows from the operation of a project and the cash outflows related to payment of the debt financing. A number of producers of RES power plants equipment offer competitive leasing terms without requiring any down-payment (Sunpower 2011). The competitive interest rates on the offered leasing coupled with the warranties which will hedge the exposure of the investor to additional operational costs related to replacing damaged equipment could further foster the returns of the investor in a RES power plant.

4.5.1.5. Tax Planning and Currency Risk

According to Dodonova and Khoroshilov (2007) a set of tools related to the tax planning regarding the repatriation of the income generated by a foreign subsidiary, or as in the light of this research, a RES power plant, could significantly impact the returns of an investor who invests in a country outside his home one. The authors present a technique which considers a correlation between a delay in the period of repatriation and the volatility in the exchange rate between the foreign investor's home country's currency and, as in the case of this research, the BGN. In addition, Altshuler and Gruber (2003) present a number of techniques which could bypass the costs related to repatriation of funds including investing in passive assets, investing in high-tax affiliate and using multiple tiers to reduce repatriation taxes. All these techniques could be used depending on the tax system of the home and host countries. Last but not least, Sikka and Willmort (2010) introduce the concept of transfer pricing as an eligible tool which could assist a company to manage its tax planning pertaining to its foreign subsidiaries.

An additional event which could hamper the returns of the foreign investor's investment in RES projects in Bulgaria is the fact that the FIT is denominated in Bulgarian Lev (**"BGN"**). From the one hand this is not an issue for a foreign investor from the EU as Bulgaria adopted the Currency Board in 1997 and pegged the exchange rate of EUR / BGN at 1.95583 (Bulgarian National Bank 2011). However, for a foreign investor who is not from the EU, the fluctuation between the BGN and his home currency could drastically affect the returns on his invested capital. Therefore, Walker (2007) suggests that an investor should hedge his exposure to fluctuations in the exchange rates between his home currency and, as in the light of this research, the BGN by buying future currency put option, which would secure the investor's future cash inflows and protect him from such a risk. Ogunc (2007), and Lioui and Poncert (2002) additionally outline various hedging technique allowing an investor to manage the future value of income generated by his investment in a RES power plant in Bulgaria.

As outlined in Chapter 1, further elaboration of these topics will be omitted as they are subject to a more detailed research which could be a topic of a different study.

4.5.2. POST-INVESTMENT PROFIT ENHANCING TOOLS

Once the power plant has been completed and put into operation, the foreign investor could refinance his equity invested in the project or exit the investment by selling it to another investor. Both of these techniques could enhance the returns on the investor's capital and will be analyzed in this section of the study.

4.5.2.1. Refinancing of the Project

An option for a foreign investor to return the equity invested in a RES power plant in Bulgaria is to refinance it. According to a number of authors the cost of equity is higher than the cost of debt (Gatchev et. al. 2008, Lai 2011, Gaud et. al. 2006). Therefore, by refinancing the equity invested in the project, the investor could receive back part of his invested funds and decrease the project's cost of capital. On the one hand this would allow the investor to increase the returns on investment as the debt is tax deductible, hence it is a cheaper source of capital (Lim 2011). In additional, by drawing back part of the equity invested in the project, the investor could use the capital to increase the installed capacity of the power plant or to look for an additional investment opportunity in Bulgaria, hence avoid the opportunity costs of the investor's invested equity. Last but not least, by refinancing the project and withdrawing part of the equity, the investor could transfer part of the power plant operational risk to the bank.

According to Renewable Energy World (2009) the purchase power agreement of a RES power plant could serve as an instrument for an investor to refinance the equity contributed by him in the project. The purchase power agreement is a long-term contract obliging the respective EDC or NEC to procure the electricity generated by the power plant for 12 years, 15 years or 20 years, depending on the type of RES power plant. Such a contract secures the future cash flows of the power plant; hence, it serves as a security for the bank to issue a loan to the investor for refinancing his equity. Additional aspects to be considered by an investor are the factors which make a project bankable as presented by Lüdeke-Freund and Loock (2011). The authors performed a research among top German institutions which finance RES projects. The outcome of the study have shown that for the financiers the most important factors upon deciding whether to refinance a RES project are the brand of the system components, the capacity of the power plant and the equity invested by the investor.

4.5.2.2. Investment exit stage

According to Mr. Theodore Tsacheff and Mr. Vladimir Alitchkov, co-owners of PV power plants in Bulgaria, there are numerous risks pertaining to the operation of a RES power plant. Some of these are unexpected operational costs as system components breakdowns, social risks related to robbery and vandalism against the power plant, risk related to the capacity of the grid due to future connection of RES power plants in the region which may not allow for the power plant to feed the grid at its maximum capacity, and political risk as introducing taxes on the revenues of the RES power plants with retrospective effect as in the case in the Czech Republic (Renewable Energy Focus 2010). Therefore, the professionals support the idea that by selling the already operational power plant to another investor, the IRR levels of the investment will go up and the risks outlined above will be bypassed. The professionals further suggest that they could use the funds received from selling the power plant in order to develop another RES power plant and again exit it when it is already constructed and in operation. The practitioners support the concept that once they have already been through the entire process of development and construction of a power plant in Bulgaria, the second time they go through this procedure will be more efficient, both in terms of time and funds. By incorporating such an investment strategy, they could harness a constant investment cycle which will allow them avoid the opportunity costs related to the funds "locked" in the operational power plant.

According to Mr. Theodore Tsacheff the best moment to sell the RES power plant is as of its first day of operation as in the first year of operation the degradation of the system components is lowest. This allows the power plant to generate maximum amount of electricity, hence to bring the greatest revenue streams to the investor. By having high levels of revenue, the investor could negotiate a purchase price for the power plant at a higher IRR level.

The two most common ways to exit a RES power plant investment are initial public offering (**"IPO"**) and selling the project to another investor (Energy Alternative India 2010). The IPO constitutes issuing of shares on the behalf of the SPV holding the project rights and selling them to dispersed investors on a particular stock exchange (Baker and Gompers 2003). This is a tool which would allow the investor to gain capital to repay any outstanding debt, shareholders obligations, fuel growth or exit the project. On the other hand, the investor may opt to sell the project to an investment fund. According to Mr. Theodore Tsacheff examples for such investment funds active on the Bulgarian RES market which may be interested to procure the project from the investor are Reiffeisen Energy and Environment GmbH and BNP Paribas Clean Energy Partners.

4.5.3. POST-OFF-TAKE PERIOD PROFIT ENHANCING TOOLS

According to Eltawil et. al (2009) the lifetime of the assets of a solar, wind, hydro and biomass power plants exceed 25 years. This is significantly longer that the mandatory by law off-take period for electricity generated by such power plants. Therefore, various techniques should be considered once the secured off-take period of a RES power plant expires and it has to compete with the other electricity producers on the energy market.

4.5.3.1. RES Power Plants Selling Electricity as a Hedge

Berry (2003) supports the concept that the increasing price of fossil fuels drastically affects the electricity prices on a world-scale basis. The author further claims that the due to the flat learning curve in the RES technology industry, the prices of the system components of a RES power plant have drastically decreased over time. Owing to the decreasing RES technology and increasing fossil fuel prices, the scholar suggests that prices of electricity generated by conventional resources power plants could reach parity by those generated by a RES power plant. The claim of the author is further supported by Graph 3 showing that according to the latest FIT and market prices of electricity in Bulgaria, the prices of electricity generated by hydro power plants and those of conventional power plants have almost reached parity. Furthermore, according to a number of industry expert in Bulgaria, the market prices of electricity generated by RES and conventional power plants will reach parity in the next 3 – 5 years (Investor 2010, EU Inside 2011).

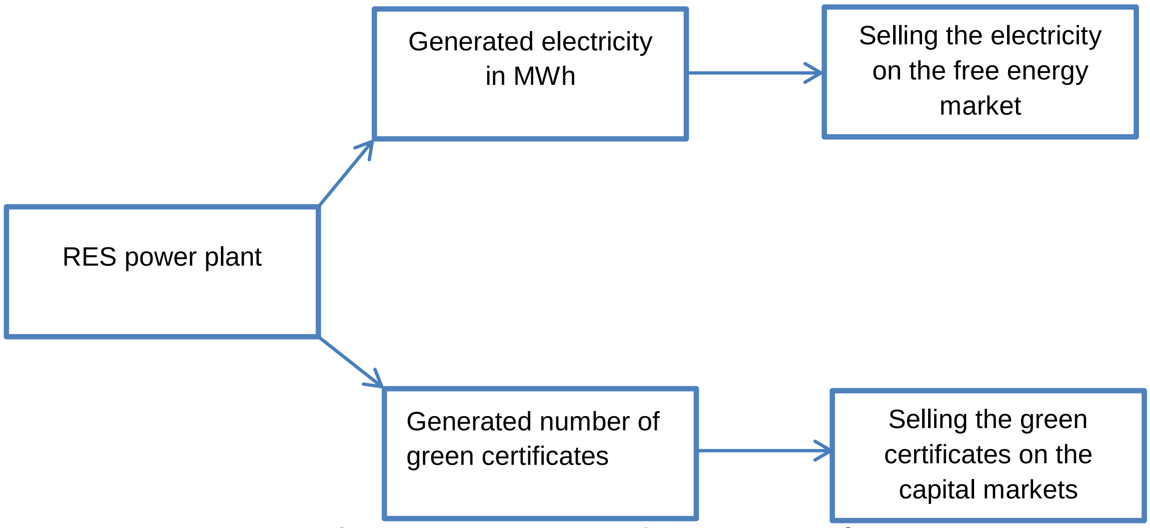
Owing to these reasons, Bolinger and Wiser (2008) claim the due to the fact that a RES power plant generated electricity is not dependent on feedstock, except the biomass one, the prices of electricity generated by such power plants will be stable in the future, therefore, it could serve as a hedge against increasing prices of power generated by fossil fuels. The authors present this concept by describing it through a Capital Asset Pricing Model (**"CAPM"**) – a financial tool for assessing the risk and profitability of an investment portfolio. The scholars intrepid the CAPM in a manner which correlates the fossil fuels prices with the stock market. According to Bolinger and Wiser (2008) as the fossil fuels prices increase, the stock market declines as the surging prices of conventional energy resources damage the economy.

In these regards, the fossil fuels are considered to have a negative beta[20]. In order the EDC, NEC or the big manufacturer in Bulgaria demanding high volume of electricity to bypass this negative beta and hedge their exposure to fluctuating fossil fuels energy prices, they could buy a future call option from an investor owner of a RES power plant. According to Berry (2003) this could happen by signing a long-term contract between the consumer of electricity and the owner of the power plant. According to the author, the long-term contract could be with a fixed price for the entire contractual period, or to be adjustable to a certain parameter as inflation index for instance. Such an instrument has not been implemented in Bulgaria yet, however due to the fact that the country has import dependency of fossil fuels of over 90%, any decrease of supply from 3rd countries of fossil fuels could drastically increase the electricity prices in the country and the RES hedge used as a feasible instrument securing the risk to such fluctuating energy prices. There are number of agencies which offer brokerage services between enterprises offering and looking for such RES energy futures, among which is Eco Power Hedge.

4.5.3.2. Green Certificates Trade

The green certificates are tradable energy commodities issued by the respective authority for 1 MWh of electricity generated by a RES power plant (Ringel 2005). They represent the amount of CO2 emissions saved by a RES power plant for the generation of 1 MWh of electricity. The green certificates are an alternative of the FIT for stimulating the investors to contribute their funds to RES power plants. In Bulgaria, the investor can opt for either to sell the electricity generated by the RES power plant at a fixed FIT for the entire off-take period, or to sell the electricity generated by the power plant on market prices and receive green certificates for each 1 MWh of generated electricity (Wind Power BG 2008). The green certificates could be traded as bonds and shares on various capital markets including Amsterdam Capital Trading and Warsaw Stock Exchange. In addition, as Mr. Andrey Bachvarov claims, the owner a RES power plant could directly sell the green certificates to a manufacturer which emits a large number of CO2 emissions in the air – according to the Kyoto Protocol (1997), by 2012 every county has to limit the CO2 emissions in its air to a certain percentage, therefore, the respective countries impose restrictions on the big manufacturers for the maximum amount of emissions they can release in the air. If the respective manufacturer is not to meet these targets, it has to procure green certificates in order to compensate for the excessive pollution caused by its operation.

For a RES power plant in Bulgaria once the secured by the law off-take period expires, selling green certificates is an additional revenue stream, besides the trade with electricity (*Graph 7*). These additional funds could significantly increase the returns of the investor as the current price per 1 ton of CO2 emissions is EUR 12.98 (Dnevnik 2011).



Graph 7. Revenue Streams of a RES Power Plant

Source: Wind Power BG (2008)

[20] CAPM = Risk Free Rate + beta X (Expected Market Return – Risk Free Rate)

5. Discussion

As the results of Chapter 4 imply, the profit maximizing tools for a foreign investor can be clustered in three main segments – pre-investment risk and financial analysis, post-investment IRR level enhancing tools and post-off-take period revenue streams.

The PEST analysis and ANP models were considered as recognized and already established in the literature tools to assess the risk level of a given investment opportunity both at micro and macro level. However, as Mr. Vladi Vladimirov assumes, the legal system in Bulgaria is still in a process of reformation which allows for different interpretation of the law, especially on a District level as the various municipalities in Bulgaria do not have a uniformed administrative and legal system. Therefore, as Mr. Andrey Bachvarov claims, when an investor is interested in a RES investment in Bulgaria, they make assumptions about the RES sector which are based on articles of the laws which are not always applicable. Therefore, for the sake of avoiding a situation where the investor has contributed funds to a RES power plant in Bulgaria and expects from the local authorities certain actions, as grid rehabilitation for instance, Mr. Bachvarov suggests that a feasibility analysis on the RES industry in Bulgaria prior to the investment should be performed. In this feasibility analysis, all real-life examples for the different interpretations of law in Bulgaria should be examined and the investor should determine whether he is ready to cope with the discovered precedents prior to his investment. Such a feasibility study could be performed instead of a PEST analysis or as a complementary part of it.

Once the macro risks have been identified and analyzed, this study considers the ANP model as an eligible tool for evaluating the micro risks pertaining to a RES investment opportunity. According to Mr. Bachvarov and Mr. Nedyalkov, as the model was developed based on the Spanish RES sector, its applicability should be tested to the Bulgarian RES environment. For the sake of determining whether the model is employable in Bulgaria, this study considered a gap analysis of a particular case study describing the practices harnessed by BICA when the company analyzed the eligibility of a PV investment opportunity located in South-eastern Bulgaria and those suggested by the ANP model. This particular project was an investment target of an institutional investor. Prior to analyzing an investment opportunity, BICA develops a breakdown of the entire investment process which outlines in a logical sequence all the relevant steps pertaining to the analysis, evaluation, acquisition and construction of the investment opportunity, Picture 1 below is a snapshot of the investment process reakdown under question.

Stages	Actions / Responsibilities	Inputs & Outputs	Week: From / To
Step 1: IDENTIFICATION AND SELECTION OF INDUSTRY EXPERTS	[BICA] ▪ BICA ***identifies*** the most prominent local RES industry experts for the purpose of obtaining credible and qualified opinion during the selection and evaluation of potential investment opportunities, using the following channels: - EPC contractors active on the Bulgarian renewable energy market; - local construction companies with experience in the development of renewable energy projects in the country; - local reputable energy associations and organizations; - owners of already operational projects who have used the services of the experts; - prestigious universities and academic institutions with relevant expertise and proper credibility to serve as a reliable source; ▪ BICA ***develops*** a specific set of selection criteria for the sake of shortlisting the eligible industry experts from the entire pool of identified ones, such as: - experience in the respective field (at least 2 years for solar and wind and at least 7 years for hydro power); - significant role in the development of at least two relevant projects in Bulgaria; - relevant education and degree (higher education, technical degree in the corresponding field of expertise); - reputation cross-checked and confirmed; ▪ BICA ***interviews*** the pool of identified industry experts with the goal of confirming their compliance with the above criteria and shortlisting the eligible ones;	[INPUTS] ▪ Already established contacts with the institution / persons listed as experts sourcing channel; [OUTPUT] ▪ Industry experts eligible selection criteria; [INTPUT] ▪ Industry experts selection criteria;	

Picture 1. BICA's Breakdown of an Investment Process

Source: BICA

This practice assists BICA to gain an overall view of the entire investment process. Once the company has a general outlook of the process, BICA evaluated the riskiness of the investment opportunity by looking into the political, technical, economic, time delays, legal and social risks which may inhibit its IRR levels. In the early stage of the project evaluation phase, BICA looked into all the factors described in the ANP model besides the geologic surveys of the area where the power plant will be constructed and the detailed zoning planning of the project. In the last stages of project analysis and advanced negotiations for the acquisition of the project from its owners, BICA examined the geologic surveys of the land plot. It was discovered that there are underground waters beneath the property. Should BICA has followed the framework outlined in the ANP model, the company would have saved a substantial time and efforts to examine a project which has a high level of risk of flooding and additional operational costs for its construction. An additional factor which BICA did not examine in the early stages of the evaluation of the project, as suggested by the ANP model, was the project detailed zoning planning. On the final stage of the project due diligence and negotiations for acquisition, BICA discovered that the document was approved solely by the Mayor, but not by the District Council as required by the respective legislation. In general this is a risk which is subject to the reading and different interpretation of the law. Such a risk would not have been considered as a "deal breaker" for a private equity investor. However, due to the fact that the investor willing to acquire this investment opportunity was an institutional investor, such a risk would not have been tolerated and the investment opportunity rejected. These two real-life examples suggest that BICA have missed to evaluate the project using two risk parameters outlined in the ANP model and by doing so pursued to acquire a high-level risk investment opportunity. This implies that the ANP model has practical implication for the Bulgarian environment and could have helped BICA detect RES investment opportunity risks on the early stages of the project evaluation and present them to the foreign investor, allowing him to determine whether he is ready to cope with them. However, according to Mr. Nedyalkov, in order the applicability of the ANP model to be secured, it has to be adjusted to the Bulgarian RES sector environment by considering BICA's local specific know-how and amending the steps pertaining to the development of a RES power plant (*Graph 4*), presenting the risks which are applicable and relevant for the Bulgarian RES sector (*Table 1*) and determining the weights of the risks which are most relevant to the pre-screening and detailed analysis of a given RES investment opportunity in the country.

Once the risk level of the investment opportunity determined, this study considers the ROV model as an eligible financial tool for evaluating the economic feasibility of the selected investment opportunities. In its practice, BICA uses a Capital Budget model for the above purpose. However, as presented in the Chapter 4 the ROV models presents various items not included in the Capital Budget model, which could significantly affect the returns of the investor. The practical application of the ROV model has been confirmed by Mr. Theodore Tsacheff who stated that during his working experience in Shell such a model has been used for evaluation of the feasibility of the energy target investments of the Dutch corporation. However, as the ROV model requires intensive and complex analysis of various variables which may take significant time and efforts. Therefore, BICA should launch a pilot test on the applicability of the model in order to determine whether it is appropriate for the company's working process.

After selecting the RES investment opportunity with the greatest returns, this researched looked into the various incentives offered by the Bulgarian market for stimulating the development of RES power plants in the country. According to Mr. Vladimirov and Mr. Nedyalkov, the various preferential credit lines and tax holiday incentives offered by the respective institutions are eligible means of "free" cash for the investor which could positively affect his returns. In addition, the external financing which could be sourced by banks interested to finance RES projects, could further enhance the returns of the investors as the cost of debt capital is cheaper than the cost of equity due to various reasons including opportunity costs and the tax-deductible property of the debt.

Once the RES power plant has been constructed and put into operation, the Purchase Power Agreement serves as a security which could be used by the investor to refinance the equity invested in the project by a loan from a bank. Mr. Alitchkov currently refinanced his 2 MWp PV power plant by using this tool. He claims that this instrument may help the foreign investor increase the IRR levels of the investment by increasing the amount of debt in the capital structure of the project. This would decrease his overall capital expenditures as the loan is tax deductible. In addition, by refinancing the project, the investor will receive his invested in the project equity “today”, instead of waiting for “tomorrow” when these funds will be generated by the operation of the power plant. This will decrease the investor’s opportunity costs, an important aspect in the light of one of the golden financial rules: “A dollar today is worth more than a dollar tomorrow”.

An additional considered profit maximizing tool when the power plant is already operational is the investor to exit the project and sell it to an investment fund. This practice was discovered during an interview with Mr. Theodore Tsacheff and its eligibility later confirmed by a literature review. By exiting the investment, an investor bypasses all the operational, social and political risks pertaining to the operation of a RES power plant. It further secures the returns of the investor as he could negotiate the IRR level at which the project will be sold and avoid the costs related to the risks mentioned above. Last but not least, by selling the project, the investor will receive the funds from the future cash flows of the power plant “today” and by doing so bypass opportunity costs. Because of this, the investor could take advantage of an additional RES investment opportunity which may arise and capitalize on the experience he already has in the development of RES power plants in Bulgaria.

The last set of tools which may maximize the returns of the investor is when the lawfully guaranteed off-take period expires and the RES power plant has to compete with the conventional electricity power plants on the free energy market. Two profit increasing concepts which have not been implemented in Bulgaria yet were examined. First of all, the option for selling the electricity as a future hedge call option mitigating the fluctuation in prices of the fossil fuels was considered. Even though such a practice has not been implemented in Bulgaria yet, it could serve as a feasible mechanism against the rising electricity prices in the country (*Graph 3*). According to Mr. Bachvarov and Mr. Alitchkov, even though such an option has not been implemented in Bulgaria yet, it has grounds on the local energy market as the parity in the electricity generated by RES and conventional power plants is expected to occur in the next 3-5 years. In turn, as the electricity generated by a RES power plant does not depend on the prices of fossil fuels and costs of RES electricity in the future could be forecasted without significant deviations, allowing the big demanders of electricity in the country to hedge their exposure in case of increasing fossil fuel prices. In addition to the hedge tool, the green certificates which are issued for each MWh of produced RES electricity because of saving a certain amount of CO_2 emissions in the air, could serve as an additional revenue stream of a RES power plant. According to SEWRC (2005) the electricity generated by RES power plants will be procured at a fixed FIT until an eligible trade system for green certificates in the country is introduced. Currently, the RES power plants sign long-term PPA contracts with the respective EDC or NEC which purchase the generated electricity at a fixed FIT. However, at the time when the PPA contracts expire, the SEWRC most probably would have already introduced the green certificate system in Bulgaria. This system would allow the producers of green energy not only to sell the generated electricity on the free energy market, but also to take advantage of the trade with green certificates and gain an additional revenue stream. Even if SEWRC has not introduced such a system by the time of expiration of the PPA contract, Mr. Bachvarov assumes that certifying agency as Rina could issue a certificate for the RES power plant which will allow it to generate green certificates on the base of CO_2 emissions saved from its operation. According to Mr. Bachvarov, currently in Bulgaria the trade with green certificates is an unutilized tool which could increase the revenues from the operation of a RES power plant. However, in order BICA to grasp this opportunity and have a competitive advantage over the other consultancy companies in the sector, BICA should gain a better and an in-depth understanding about the trade with such commodities.

6. Recommendations

The main topic of this research was:

How should Balkans Investment Consulting Agency support the foreign investors in their efforts to enhance their returns on renewable energy projects in Bulgaria?"

Following the findings from Chapter 4 and the performed discussion in Chapter 5, this research provides the following recommendations to BICA regarding the company's consultancy role to foreign investors seeking to enhance their returns in RES projects in Bulgaria.

Recommendation № 1 BICA should use a combination of a PEST analysis and a feasibility study in order to determine the major macro risks pertaining to a RES investment in Bulgaria. The alternative of this option is the company to use the technique separately. However, if this is the case, the desired effect of identifying all the political, economic, social, technical and legal risks related to the development of a RES project in Bulgaria will not be achieved. An additional best case scenario for using such a technique would be a mitigation strategy to each of the identified risks to be developed.

Recommendation № 2 BICA should analyze the type of investor who uses its services and determines its main motives and risk tolerance related to a RES investment in Bulgaria. Such a recommendation is made as the various types of investors in Bulgaria have different risk tolerance levels. For instance as presented in the case study described in Chapter 5, a risk related to the fact that a detailed zone planning has been approved solely by the Mayor but not by the District Council, might be acceptable for a private equity and strategic investor as the main goal of such type of investors is, respectively, to maximize their returns even at the cost of higher risk and to establish their positions on the Bulgarian market by integrating their equipment in local RES power plants. On the other hand, an institutional investor who is seeking for secured returns will not tolerate such a level of risk. Because of these differences in the risk tolerance level of the various types of RES investors in Bulgaria, BICA should consider these difference when it selects and analyses the investment opportunities for its clients.

Recommendation № 3 BICA should consider the ANP model when the company evaluates the micro risks of a RES investment opportunity to help investors enhance their return. The best case scenario would be the company to alter its current way of working by incorporating the ANP model in the investment procedure breakdown method currently used by the company (*Picture 1*). However, such an alternative will require a change management of the company's current manner of working and further cross-validation of the practical eligibility of the amendment to the investment procedure breakdown. Furthermore, as the ANP analysis requires a substantial number of decision-making to be undertaken by BICA related to the selection of a given investment opportunity over an entire pool of identified ones; BICA should consider the importance of any potential agency problem. For the sake of avoiding such an issue, BICA should employ a corporate governance culture which demands for keeping a record of all the analysis performed on each of the identified investment opportunities. Such a practice will give security to the foreign investor that BICA has opted for the most feasible investment opportunities and an agency problem has not occurred during the investment selection process.

Recommendation № 4 BICA should consider the ROV model when the company analyzes the financial feasibility of an investment opportunity. However, the ROV model may not be applicable for the company's current way of working as it is rather information intensive and requires detailed analysis of various factors related to a RES project. Due to this complexity, on this stage, BICA may not have the necessary resources to implement such a model. If this is the case, the company should consider continue using the Capital Budget model as an eligible instrument for performing financial analysis on the identified investment opportunities.

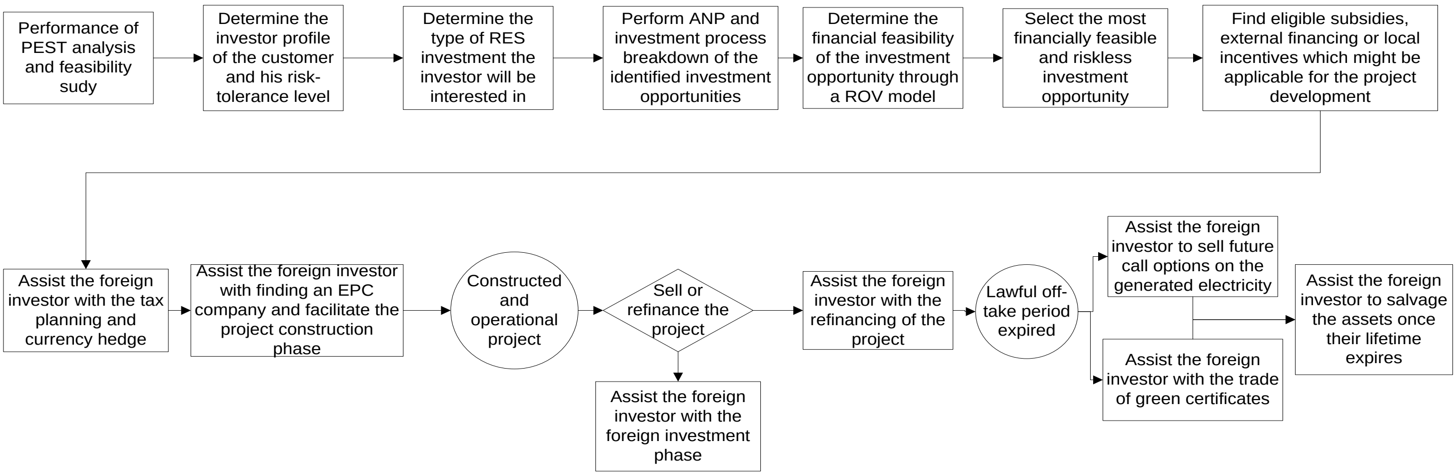
Recommendation № 5 BICA should take advantage of the various stimulus and subsidies offered by the local and European authorities for development of RES projects in Bulgaria. As outlined in Chapter 4.5.1 such subsidies are the RES credit line offered by EBRD, the European operational programs

"Development of the rural regions" and "Energy effectiveness" as well as the tax holiday option offered by the Bulgarian government. An alternative to this option is the external financing as a means of enhancing the project IRR levels.

Recommendation № 6 BICA should gain knowledge and establish working relationships with the various banks in order to assist the refinancing of the already operational RES power plants. Such a refinancing will allow the investor to enhance his returns on the project. In addition, the company should develop business ties with investment funds who may be a potential buyer of an already operational RES power plant in Bulgaria. Such relationships could facilitate the investment exit stage if the foreign investor wants to sell the project and enhance his returns.

Recommendation № 7 BICA should undertake innovative for the Bulgarian RES market practices as selling future call options to enterprises willing to hedge their exposure to fluctuating fossil fuel prices. Such a trade with future options could constitute an additional revenue stream for the foreign investor owners of RES power plants in Bulgaria. Last but not least, BICA should gain knowledge about the trade mechanism of green certificates. Such knowledge could enhance the foreign investor's returns as green certificates sector in Bulgaria is expected to emerge in the future. BICA could take advantage of this opportunity by gaining the relevant knowledge and expertise for the segment before its competitors.

To conclude with, Graph 8 presents all the models, tools and techniques, some of them not elaborated in this research, which could be employed by BICA when the company assists the foreign investors to enhance their returns on a RES investment in Bulgaria.



Graph 8. Graphical Representation of the Return Enhancing Recommendations to BICA

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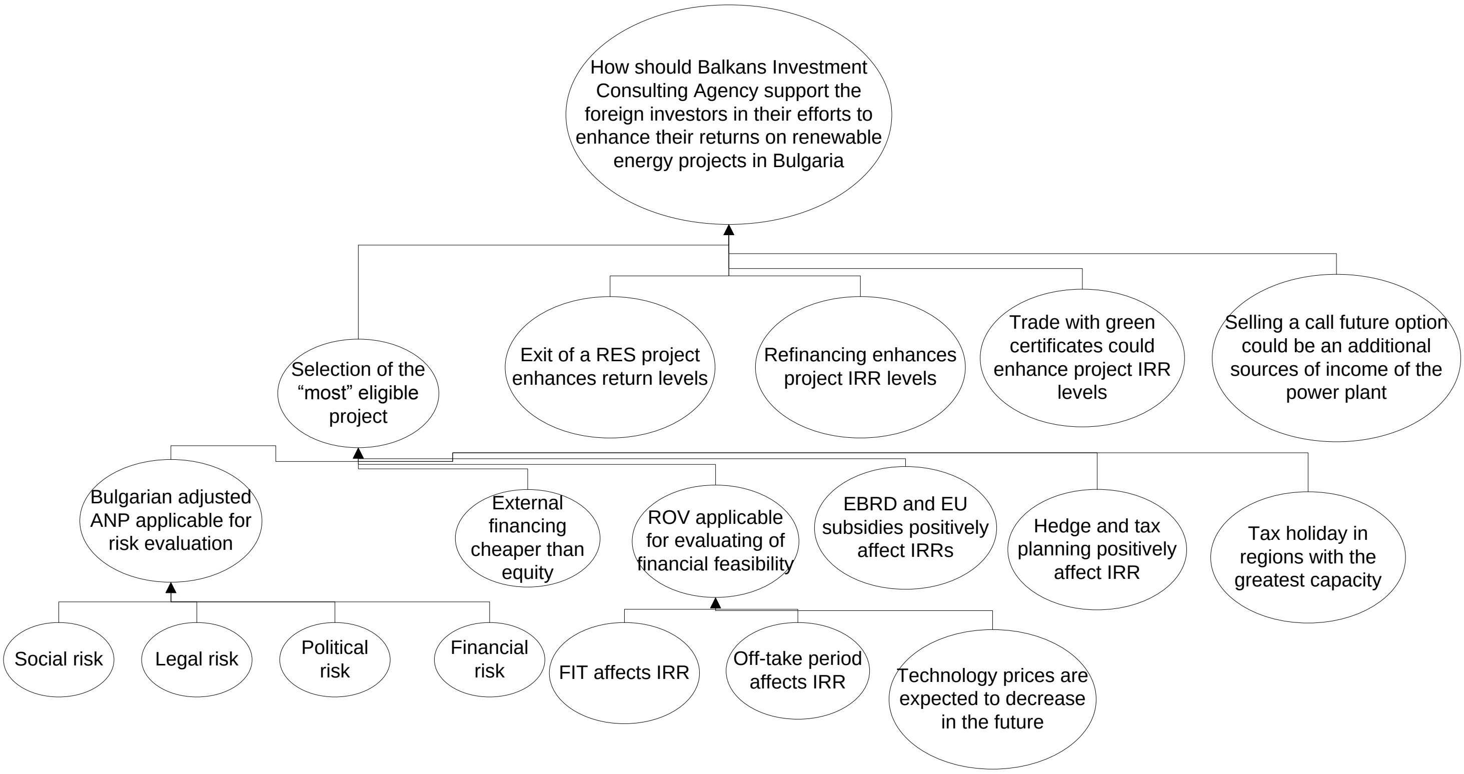
Appendix 1 – Strategic Options Development and Analysis



Graph 9. Representation of SODA Cognitive Map