CANDOLE PARTNERS

PHOTOVOLTAICS IN BULGARIA

INVESTMENT RESEARCH REPORT

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TABLE OF CONTENTS

LIST OF ABBREVIATIONS

Abbreviation	Full name
APEE	Association of the Producers of Ecological Energy
BEH	Bulgarian Energy Holding
BNB	Bulgarian National Bank
EC	European Commission
EDC	Electricity distribution company
EIA	Environmental Impact Assessment
EBRD	European Bank for Reconstruction and Development
FIT	Feed-in tariff
GC	Green certificate
HPP	Hydroelectric Power Plant
JASPERS	Joint Assistance in Supporting Projects in European Regions
JI	Joint Implementation Scheme
MoE	Ministry of Ecology
MoEE	Ministry of Economy and Energy
NEC	National Transmission Company
NSI	National Statistical Institute
NPP	Nuclear power plant
EUAFDR	European Agricultural Fund for Rural Development
PPP	Public Private Partnership
RES	Renewable Energy Source
RIEW	Regional Inspectorate of Environment and Water (a structure of MoE)
SEWRC	State Energy and Water Regulatory Commission
TPP	Thermal power plant
TSO	Transmission system operator

1. EXECUTIVE SUMMARY

This report focuses on the photovoltaic energy sector in Bulgaria as a potential area for investment. It is intended to provide the reader with an overview on the economics and regulation of the industry.

Market Characteristics: The photovoltaic electricity market is growing rapidly. Installed capacity grew from 80kWp in 2007 to 2.5 MWp in April 2009, with a similar performance likely to persist in the next 3 years. In 2008 the value of the market was €0.7m, expecting to reach €54-58m by the end of 2011. Existing market participants are primarily small PV plants, with only one larger park (1MWp) currently in operation.

Primary source availability: Recommended zones with beneficial sun irradiation make up 3% of the territory. The most appropriate regions for photovoltaics are in the south-western parts (close to the Greek border) and north-western parts of Bulgaria (along the Black Sea coast).

Tariff Regulation: Electricity produced from PV is purchased at €420.79/MWh (for <5kWp) and €386.03/MWh (for >5kWp). The preferential rates are guaranteed for 25 years (if the project is completed before 2011) and are expected to increase every year. The law stipulates that the electricity distribution companies should (1) provide priority grid access to producers and (2) purchase all the electricity generated from PVs. This favorable legislation will be reviewed in 2011, but it is highly likely to be extended afterwards.

RES Policies: The tariff regulation has been implemented in response to the 20:20:20 directive by the European Commission. Bulgaria's target share is 16% from RES in final energy consumption. Efforts by the government to reach the objective have led to violations of the Bird and Habitat Protection directives. Generally, ecological regulations are weakly enforced in Bulgaria and therefore they are not expected to seriously hinder the development of the project.

Economics of investment: Initial investment is estimated at €4,261 per 1kWp. Depending on cost of debt (assuming 1-10%) and equity (assuming 5-10%), a 25-year project can have an IRR of more than 20% and an NPV of €5,233, even with deterioration in the electricity output. Annual electricity sales from 1MWp installed capacity would be approximately €480,000, with additional revenue brought through the Joint Implementation scheme (described in section 5.2).

2. GENERAL ELECTRICITY MARKET

2.1. Overview

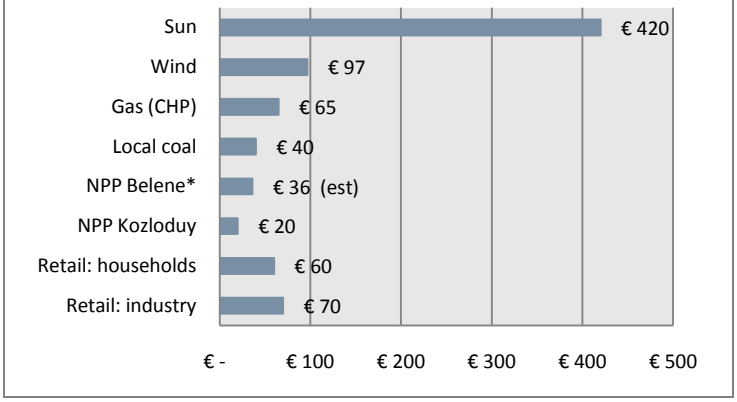
Energy sector: Bulgaria is the most energy-intensive country in the European Union, consuming 7.69 times more energy per unit of GDP than the EU27 average[1]. The Bulgarian energy dependence is growing – between 2005 and 2007 production of primary energy decreased by 3.8% p.a., while net imports increased by 4.5% p.a.*

Electricity production: In 2008 Bulgaria generated 45TWh (down 4.3% y/y) and exported 5.4TWh (11.9% from gross production). The final electricity consumption for 2008 is 29.9TWh (up 1.9% y/y).

Market size: The demand for energy in 2006 was for $10.9bn[2] (nominal), of which 12.15% was for electricity[3]. Electricity market size estimates (keeping the same proportion of electricity demand) are of $3.4bn for 2008 and $3.9bn for 2010.

Regulation: In 2007 the electricity market was partially unbundled and NEC's distribution monopoly was broken. Private EDCs entered the market, but SEWRC still dictates their electricity sale price to households. Current selling and purchasing prices of 1MWh of electricity are presented in Chart 1.

Chart 1: Price of 1 MWh



Source: Dimitratchkov ;"Bulgarian energy sector: Issues and challenges", 15/04/2009

Supply: Historically, the main sources of electricity have been the NPP "Kozloduy" and TPPs fueled by locally-produced lignite. The government is formally trying to improve the energy mix and independence by:

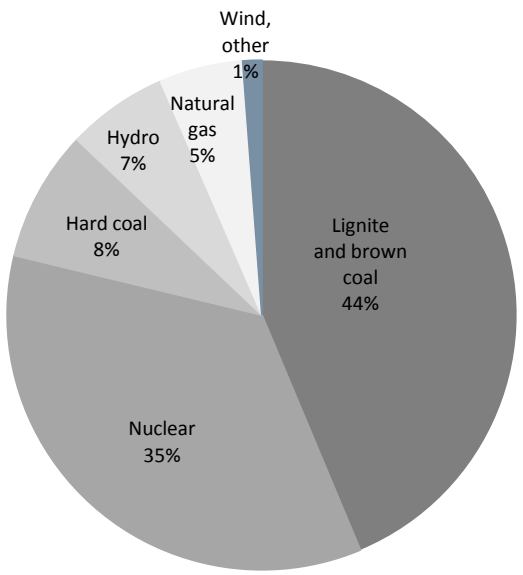
1. Privatizing TPPs. As a result, investors are more likely improve efficiency and increase capacity (such as AES installing additional 670MW in its TPP Maritza East I.
2. Increasing the use of nuclear energy (through the construction of the NPP "Belene"). This planned investment has been seriously challenged for various political and economical reasons.
3. Increasing the share of RES in final energy consumption, using various stimuli for producers.

* A detailed energy balance sheet of Bulgaria is available in section 8.1.

2.2. EU targets on RES

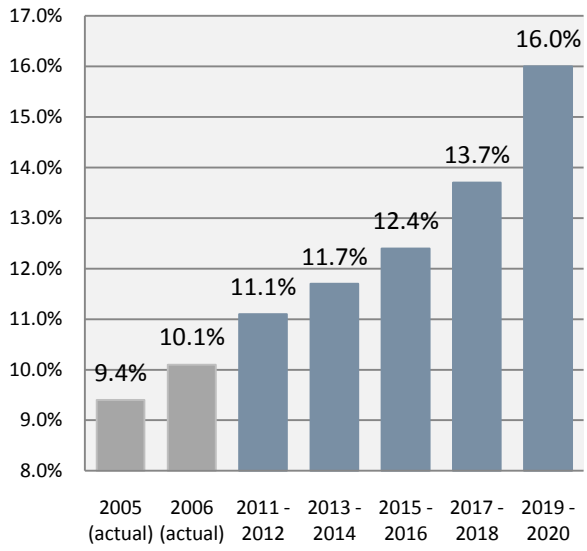
According to the 20:20:20 directive, EU27 has to increase the proportion of RES in the final energy consumption to 20% by 2020. The target set for Bulgaria is 16%, an increase of 6.6% over 15 years.

Chart 2: Gross electricity production (2008)



Source: Ministry of Economy and Energy, March 2009 bulletin

Chart 3: Targets for RES in final energy consumption



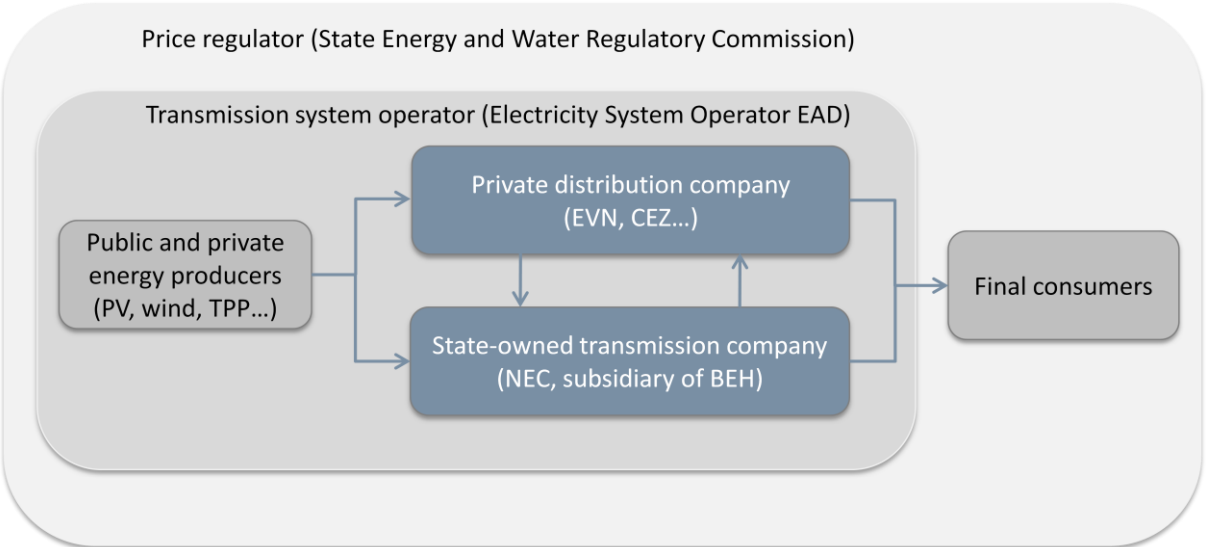
Source: European Commission, Ministry of Economy and Energy

Several sources suggest that reaching the EC objectives will be more difficult than it might be apparent. The State Energy and Water Regulatory Commission calculated that to achieve the 11.1% goal by 2011, Bulgaria will need an additional 1,400MW of installed RES capacity. The financial newspaper *Banker* believes that the figures reported to Brussels are intentionally inflated in order to avoid sanctions. For example, large hydro power plants (>10MW) are also included in the calculation, although technically they are not considered a renewable source. This discrepancy is confirmed by Eurostat data[4], which shows 7.7% RES share in final energy consumption for 2006 (instead of the declared 10.1%).

2.3. Electricity market structure

The Bulgarian electricity market is heavily regulated and only partially privatized. Until 2007, NEC was a state-owned monopolist, controlling the generation, transmission and the distribution sectors. In 2007, distribution was unbundled and three private EDCs entered the market (EVN, E.On, and CEZ). However, transmission is still conducted only through NEC (now a subsidiary of the Bulgarian Energy Holding).

SEWRC regulates EDC's retail prices to households. This very often results in conflicts between distribution companies and the regulator, as prices are often not set at equilibrium. Industrial prices are usually established through direct contracts, since Bulgaria does not yet have an electricity futures market.



SEWRC serves two other functions. First, the commission grants the licenses for electricity production. Second, it obliges NEC and EDCs to purchase all the electricity produced from RES before any other energy sources are considered. The feed-in tariffs for RES are updated annually and vary by source:

Table 1: Preferential feed-in tariffs for RES

Source	Criteria	Feed-in tariffs 31/03/2009 - 30/03/2010		
		BGN/MWh	EUR/MWh	Y/Y %Δ
Photovoltaic modules	<5kWp	823.00 лв	€ 420.79	5.24%
	>5kWp	755.00 лв	€ 386.03	5.15%
Wind	<800kW	145.00 лв	€ 74.14	3.60%
	>800kW, <2250h	189.00 лв	€ 96.63	1.64%
	>800kW, >2250h	172.00 лв	€ 87.94	2.44%
Small hydro plant	<10MW	105.00 лв	€ 53.69	8.11%
Biomass	<5MW (wood chips)	217.00 лв	€ 110.95	0.93%
	<5MW (compost)	166.00 лв	€ 84.87	2.47%
	<5MW (energy cultures)	187.00 лв	€ 95.61	1.63%

Source: SEWRC

As a result of the high RES tariffs, two conflicts have grown between stakeholders:

1. SEWRC controls both sides of EDC' transactions: purchasing price from RES and selling price to households. Electricity from RES is a minor share of the total electricity consumed, but distributors generate severe losses from it (compare 1MWh from PV – it is purchased at €420 and sold at €29). In practice, private EDCs share with the state-owned NEC the full cost of supporting RES producers (see section 4.5 for more information).
2. It is often speculated that higher feed-in tariffs for RES substantially increase the bills to final consumers. However, the Bulgarian Energy Forum calculated that the RES premium increases the weighted average cost of production of 1kWh by just 1%[5]. These contradictory claims place NEC and the EDCs in a conflicting position with the RES producers[6]. Nevertheless, the electrical companies successfully advocated a 5% increase in electricity prices from July 2009 because of the RES feed-in tariffs[7].

3. PHOTOVOLTAIC ELECTRICITY MARKET

3.1. Solar resources

Bulgaria has excellent solar resources. The electricity potential from sun is 1517kWh/m^2/p.a., or 13,000 ktoe. The average solstice is 2150h/annually, or 49% of the theoretical maximum. The Ministry of Economy and Energy estimates that 3% of the national territory is suitable for PVs. The national territory is divided into three zones, corresponding to their potential (a map with potential using optimally-inclined PV modules is available in section 8.2).

Chart 4: Theoretical solar resource potential assuming flat PV modules

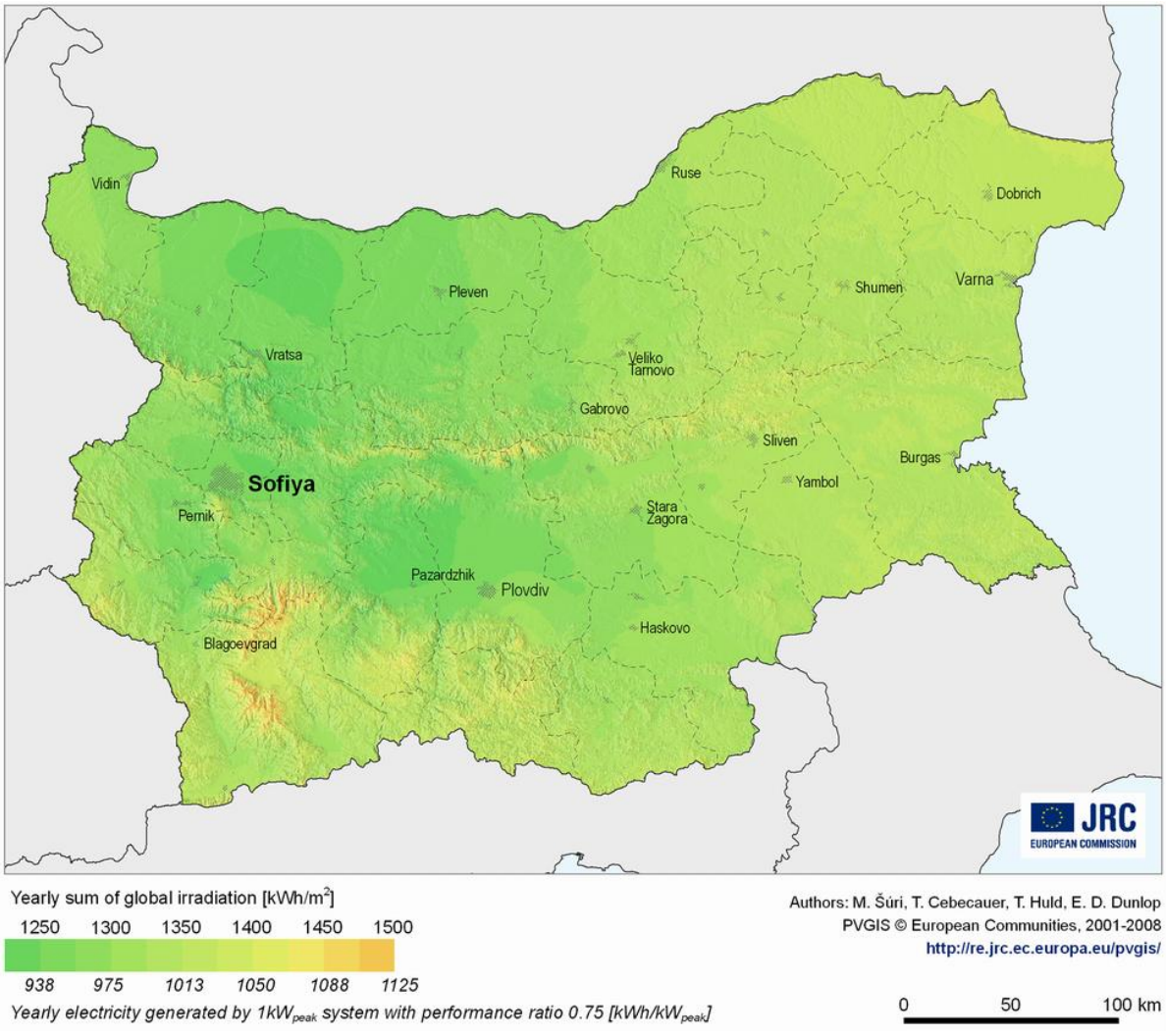


Table 2: Ministry of Economy Definitions

Region	Coverage	Solstice		Solar resources
		31/Mar – 31/Oct	31/Mar – 31/Oct	
Zone 1: Central-eastern	30% of population, 40% of territory. Predominantly mountain regions. Variable climate conditions.	Up to 1640h	Up to 400h	4 kWh/m^2/daily <1450 kWh/m^2/y
Zone 2: North-eastern	60% of population, 50% of territory. Covers agricultural areas and most of the coastal line.	Up to 1750h	400 - 500h	4.25 kWh/m^2/daily 1450 to 1500 kWh/m^2/y
Zone 3: South-eastern/western	10% of population, 10% of territory. Covers southern coastal line.	Above 1750h	Above 500h	> 4.25 kWh/m^2/daily 1550 kWh/m^2/y

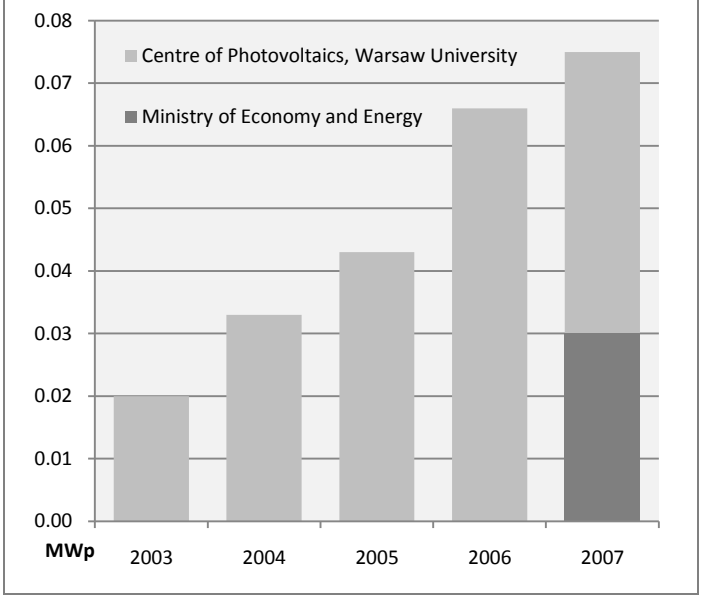
Source: Ministry of Economy and Energy

3.2. Installed capacity

Historical developments

Bulgaria has a low, but quickly growing base of installed PV capacity. Experts disagree on the historical MWp growth of the sector (Chart 5). The main reason is that before the preferential feed-in tariffs (introduced on 1/1/2007), many small PVs (19 - 40%) were connected off-grid, so information reliability for that period is questionable.

Chart 5: PV installed capacity (2003-2008)



Source: "RES Sector in Bulgaria, Invest Bulgaria Agency, March 2009
"Status of Photovoltaics in the EU new member states", PV Poland, 2008

Currently installed capacity

By the end of 2008, Bulgaria had a total installed capacity of approximately 2MWp8. By April 2009, this amount increased to 2.5MWp9. Two reasons supported the rapid growth in the last 18 months:

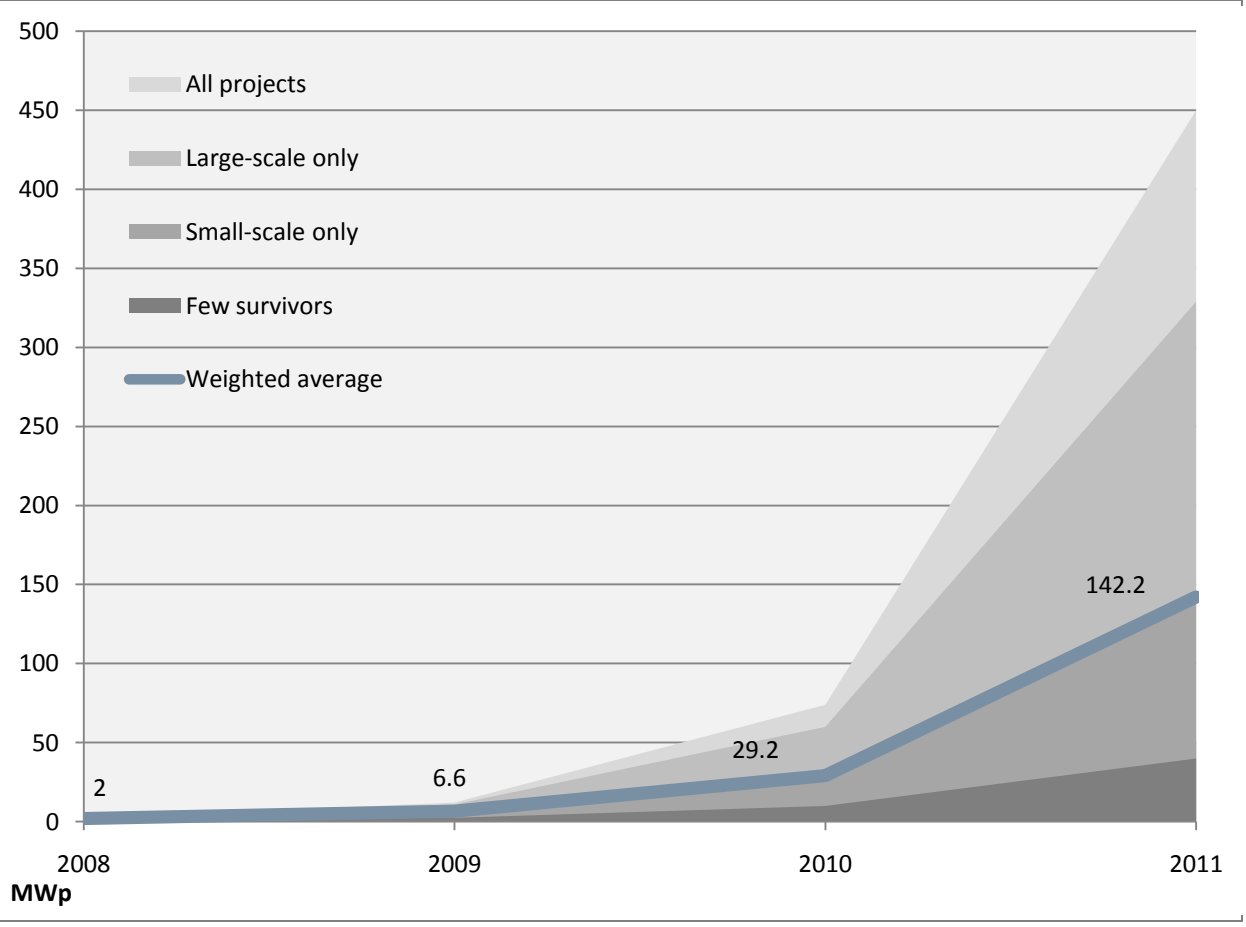
1. Several large projects under construction were recently completed. The biggest operational park (1MWp) was launched in March 2009. Despite the crisis, other large parks (>1MWp) were announced as well.
2. Financing for small projects was easy to access.
   - RES support from the European Agricultural Fund for Rural Development (EUAFDR) was announced on 1 September 2008 (see section 5.2).
   - The time lag with the financial crisis in Western Europe ensured that Bulgarian companies had access to affordable capital by the very end of 2008.

Future developments

We believe the explosive growth of the sector will continue, despite the unfavorable economic conditions. Our prognosis for the next three years is based on a weighted average of four forecasts (two aggressive and two conservative), coming from different stakeholders:

Table 3: Scenarios for future development		
Name	Weight	Explanation
All applying projects succeed	10%	This variant considers all PV projects applying for connection or electricity production license to NEC/SEWRC (between 800-1000MWp). Considering historical performance and the current crisis, this is very unlikely. Under our most optimistic scenario, we will assume that just half of the applying projects are completed (450MW).
Only large-scale projects succeed	20%	This second optimistic variant considers that only the large-scale projects listed in section 3.4 are completed by 2011. Most of them were announced during the crisis, so this possibility should not be disregarded.
Only small-scale projects succeed	30%	This conservative scenario considers that most of the listed large-scale projects will not be completed, mainly because of limited financing. Funding for small projects probably will have dried up as well, so only the EUAFDR funding is considered. The only launched big projects will be those that are very near completion, where remaining capital expenditures are minimal.
Few survivors	40%	This conservative prognosis is based on different statements by APEE, the RES industry association. Based on their credibility in the sector and their past forecasts, we assign greatest weight to APEE *(please note that 2011 is our calculation, based on previous growth factor)*.
Weighted average	100%	We assign 70% to the conservative forecasts, as we expect a slow recovery of the Bulgarian economy and relatively low credit availability

Chart 6: Scenarios for future development



3.3. Total market size

We believe the market size will grow aggressively in the next three years. There are several assumptions that we have adopted for our analysis. First, the foundation for our forecast is the weighted average for the installed capacity, presented in the previous section. Second, we use the conservative average output suggested by EC, of 973 kWh/1kWp (country-average, horizontal PV modules[10]). Third, we assume the feed-in tariffs will grow by 3-5% annually, and that the distribution of small to large projects is 20:80 (reflected in the two different feed-in tariffs). Considering these three assumptions, we believe the market size will develop in the following fashion:

Table 4: PV electricity - market size estimates

	2008 (actual)	2009	2010	2011
FIT ↑3% p.a	€ 700,661	€ 2,387,938	€ 10,922,386	€ 54,831,754
FIT ↑5% p.a	€ 700,661	€ 2,387,938	€ 11,134,471	€ 56,981,816

3.4. Announced projects

As of May 2009, the photovoltaic electricity power market in Bulgaria is highly fragmented. Investors' interest is growing, but currently there is only one large PV park (1MWp), launched in March 2009. Despite the economic crisis though, many large projects were announced, and even more have applied for connection with NEC (1000MWp).

These figures should be regarded with caution. A project enters the official NEC/EDC statistics when a permit request is registered, which is at the very beginning of the administrative process. Investors who later cancel their projects often do not notify the electricity companies, so the figures tend to be inflated. Several factors usually impede announced projects:

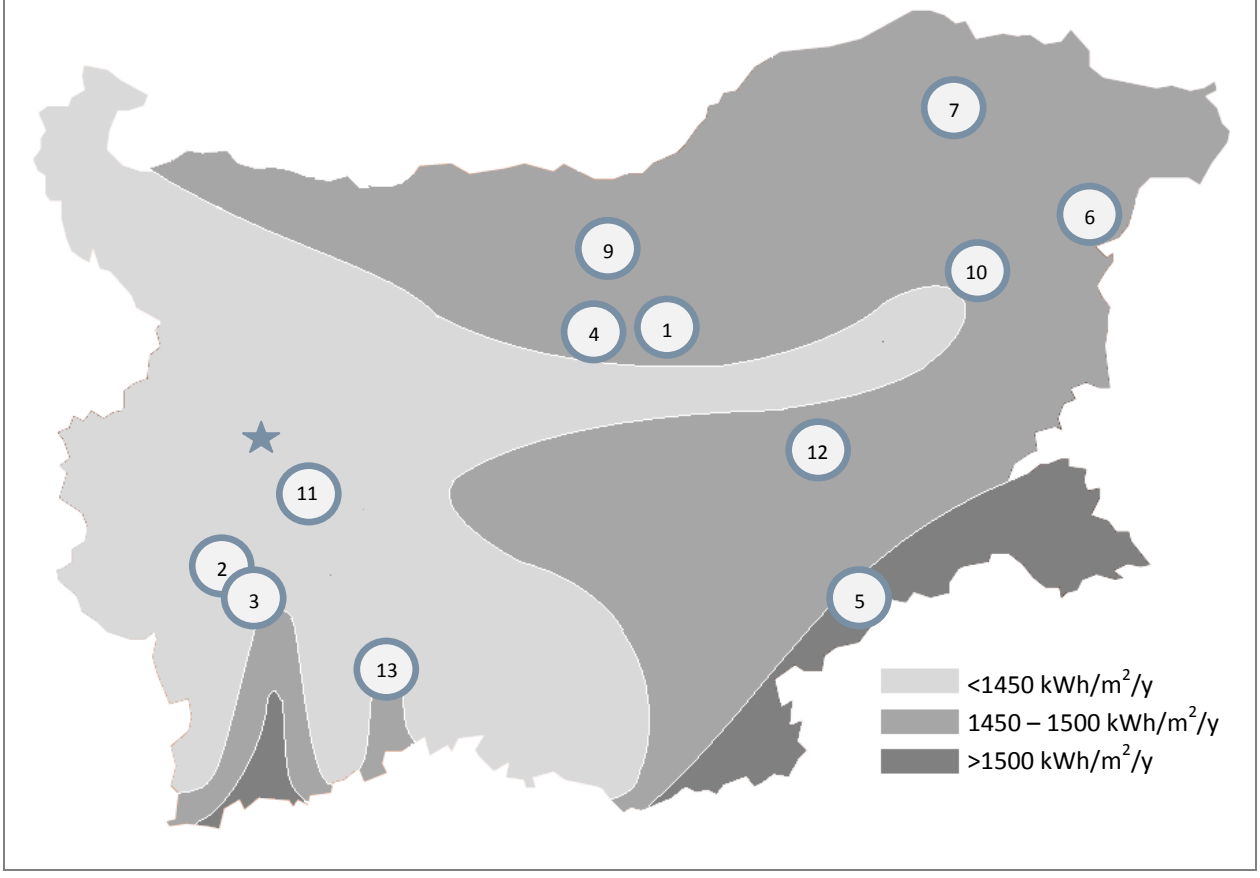
- **Improper documentation.** NEC declared that of the 68 projects applying for grid access, only 7 had all the required documents[11].
- **Natura 2000** (see section 4.3). Several RES projects in Bulgaria had to be cancelled after the last enlargement of the ecologically protected areas.
- **Grid infrastructure.** NEC and the EDCs might simply lack the capacity to connect a large-scale RES projects at the requested location. The transmission company announced that it needs €153m to be able to connect future RES projects to its network (Katreva, 2008).
- **Intentional delays by EDCs** (see section 4.5). Preliminary contracts for joining could be significantly delayed because electrical companies incur a loss from RES producers.
- **Equipment delivery.** Strong investors' interest until recently caused a long waiting period.

Some of the projects on the following page are a year or more behind schedule:

Table 5: Announced large-scale projects, by order of capacity

№	Local company name	Foreign investor	Location	Capacity (MWp)	Status	Announced investment
1	-	Natura Elements (Switzerland)	Veliko Tarnovo	90.0	Announced. Negotiating for a PPP with municipality	€ 300m
2	Solar M	Google	Dupnitsa	90.0	Announced. Negotiating for a PPP with municipality	€ 300m
3	-	-	Dupnitsa	50.0	Acquiring construction permits	-
4	Real States	Helium Energy	Sevlievo	50.0	Land purchased	€ 200m
5	Balkan Solar (McCup)	(local private equity)	Svilengrad	25.0	Announced in Q1/2008	
6	n/a	Himin Solaica (Spain)	Aksakovo	10.0	Land purchased. To be launched in H2 2010	-
7	Tervel Municipality	Kyoto (Austria)	Tervel	4.0	Announced	€ 15m
8	-	Solar Sys (Czech Republic)	(to be selected)	4.0	Announced 04/09. Discussions with project developers	€ 15m
9	Helios Watt	Unknown Swiss company	Pavlikeni	3.0	Construction started. To be launched in H2 2010	€ 25m
10	Alpha Finance Holding	(local private equity)	Yankovo (Shumen)	2.4	To be launched in Q4 2009	-
11	Advance Equity Holding	(local private equity)	Ihtiman	1.0	Launched 03/09	€ 4m
12	EVN Bulgaria	EVN (Austria)	Sliven	-	-	-
13	Plovdiv Municipality	Belvedere Financial Corporation (US)	Rakitovo	-	Land supplied for the PPP	-
			Total announced:	**329MWp**		

Chart 7: Announced large-scale projects and respective solar electricity potential



4. RULES AND REGULATIONS

4.1. Pricing

4.1.1. Feed-in tariffs

The law states that electrical companies are obliged to purchase all electricity from RES from the moment production starts, or risk a fine of €500,000[12]. This preferential feed-in is valid for a period of 25 years, but only if the park starts producing before 31/12/2011. During this period tariffs can be revised upward, but will have a limited floor.

It is important to note that a backup energy source is not required by the transmission company – electricity load fluctuations in the grid are handled by the TSO operator, not by the RES producer. According to MoEE, in cases of electrical oversupply in the grid, PV parks would not be disconnected by NEC, unlike other energy sources with lower seniority (such as TPP).

The feed-in tariffs (excluding VAT, effective 31/03/2009) for PV electricity are presented in the table on the right. Please note that Bulgaria is in a currency board and the lev is pegged to the euro at €1/1.95583.

PV installed capacity	Feed-in tariff EUR / MWh
<5kWp	€ 420.79
>5kWp	€ 386.03

SEWRC recalculates the tariffs on 31st March every year, but the precise method of composing them is not publicly disclosed. The feed-in tariffs contain two elements – a base rate and a premium. The base rate equals 80% of average electricity sale price during the previous year (equal to € 32.93 in 2008). The premium for RES cannot be less than 95% of the previous year's premium. It is composed of the following elements (with the first two given an unspecified, but higher weight in the calculation):

1. **Investment expenses.** SEWRC considers an average initial investment of €4,600 (for >5kWp) to €5,000 (for <5kWp). These rates were published in 2006 and have not been updated since then.
2. **Output.** SEWRC estimates 1342kWh per 1kWp capacity, assuming crystalline silicon, optimally inclined modules. Losses are 14-18%.
3. **O&M** costs are estimated at €0.013/kWh (for >5kWp) to €0.015 (for <5kWp).
4. **Assets** have a useful life of 25 years and use straight-line depreciation. 1% annual reduction of output due to aging of technology.
5. **WACC.** Capital structure is assumed to be 70% debt (9% cost) and 30% equity (7% cost). It is unclear how interest rates are calculated.

Based on the above information, in 2007 the SEWRC estimated WACC to be 7.72%[13]. In March 2009, WACC was updated to 7.5%, without revealing how the five criteria above have changed.

Companies can attempt to influence the feed-in tariffs. In 2007, eight hydroelectricity producers (among which Samsung) made unsuccessful proposals to the SEWRC. The proposals were focused on

different alterations – for example, requesting accelerated depreciation, or assuming higher investment costs.

4.1.2. Future market pricing mechanisms

Between 1 January and 31 December 2011, the Minister of Economy and Energy will have to present a new market mechanism for price-setting. The new market mechanism will be applicable only to projects that are launched after 1/1/2012. There are two possible schemes that can be used – (1) keep the current preferential tariffs or (2) substitute them with the issuance of tradable green certificates. The two methods are mutually exclusive and have put RES market participants in conflicting positions.

- GCs are supported by EDCs, due to the losses they incur from the feed-in tariffs. By law electrical companies have to pay RES producers FIT that are nearly 10 times higher than their sale price to end consumers. As a result, EDC' losses are mounting (especially from PV and wind parks), so they try to "reject or slow down the grid access of new facilities"[14]. According to the RES industry association, none of the three distributors has connected a RES parks since November 2008, despite the law violation.
- The current feed-in tariffs are preferred by investors and the State Energy and Water Regulatory Commission. The tariffs guarantee predictable cash flows that have limited decline (as the premium can fall by no more than 5%) and no capped growth. The existing tariff structure serves to encourage the flow of external investment funds that the ministry will continue to need in order to fulfill the EU targets. Lastly, it would be much cheaper for the government to maintain the existing mechanism rather than set up a new one.

We believe it is more likely that the priority grid access and preferential feed-in tariffs will be maintained after 31/12/2011 for the following reasons:

1. **Lack of time.** As a point of reference, implementing the Romanian GC system took two years from proposal to trading debut. Currently Bulgaria has no infrastructure for such a market, so a similar timeframe could likely be expected. This possibility of an extended timeframe is reinforced by the fact that there are no ongoing parliamentary discussions on the topic.
2. **Risk of lost investments.** It is unclear how investors will react to the GC scheme - even the SEWRC says it is "perceived as too risky by investors and creditors"[15]. There is the risk that the elimination of the existing tariff mechanism could stem the flow of outside investment.
3. **Risk of an ineffective and illiquid market.** There is always the threat that the market might not function well – price volatility is virtually non-existent on Romania's OPCOM (the spot price has remained unchanged for months). The trading volume is also very low (approximately 7 deals a month).
4. **EU targets.** Realistically, the 20:20:20 EC directive can only be fulfilled by sustaining and increasing the current level of investment interest. By eliminating the incentives, the government risks failing to achieve its EC objectives and thereby having more EU funds suspended.

4.2. Grid connection

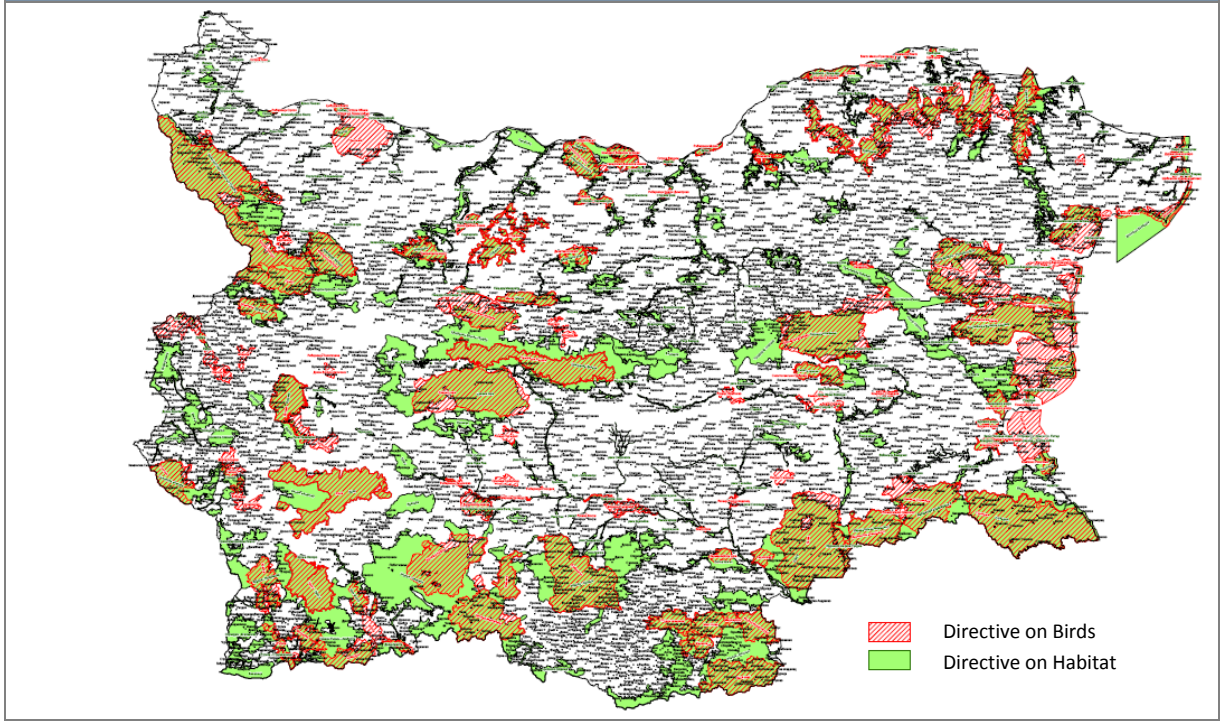
The transmission and distribution companies are obliged to connect the RES source to the closest possible point. NEC is ambiguous and non-committal about what action will be taken if the closest such electrical infrastructure has insufficient capacity to service the transmission needs of the producer. Supposedly each case would be considered individually by the electricity distribution companies, upon the producer's filing for inspection of the terrain and equipment. After a specified period the electrical company would respond with the appropriate details of how and where the producer can connect to the grid.

Another problem is that existing policies are contradictory about who pays for the grid connection. According to the RES Support Law, it is the electrical company, while the Grid Access Act states the RES producer is responsible for the fees.

4.3. Natura 2000

Following the European Union accession plan, Bulgaria had to comply with all EU directives on habitat and bird protection. As a result, the project "NATURA 2000" was established, protecting 34% of the national territory.

Chart 8: Natura 2000 protected areas (last update – August 2007)



Source: Natura 2000

After the investor registers intentions to invest in a municipality, the regional environmental inspectorate has to decide whether an ecological report on the project is necessary. Construction in Natura areas is not prohibited, but rather needs Environmental Impact Assessment (since the project could be potentially dangerous for some ecosystems) If EIA recommends cancellation of the project, then development cannot continue until the assessment is reviewed by the Ministry of Ecology.

It is debatable how strict is the enforcement of these regulations. The newspaper *Capital* claimed that regional inspectorates practically do not implement existing regulations. For thirteen months (ending 05/2008) there were 574 applications for Natura 2000 conformity in Varna, all of which were granted[16]. Our research did not reveal any serious difficulties in receiving a positive EIA for a photovoltaic park.

4.4. State support for FDI

Bulgarian authorities have adopted a number of policies in an effort to attract large-scale investments. One of them is the Investment Encouragement Act, which gives benefits to investors matching certain criteria (i.e. keep the project for five years, less than a three years for implementation, etc). If the criteria are fulfilled, then the investor can apply for a Class Certificate (either A or B). The most important benefit is that certificates ensure land acquisition without tender and usually below market prices (A, B). Other advantages include shorter waiting times (A, B) and personalized administrative services (A).

Table 6: Investment amount necessary for a class certificate

Category	Municipality's unemployment rate		
	Equal or below national average	Up to 35% higher than national average	More than 35% higher than national average
Class A	€ 35.79m	€ 23.01m	€ 17.90m
Class B	€ 20.45m	€ 12.78m	€ 10.23m

The total investment amount is the key qualifying criteria for a Class Certificate. The government provides an investment threshold for projects in municipalities with high unemployment (see section 8.3 for an administrative map and regional data):

4.5. Proposed regulatory changes

Most of the proposed regulatory changes levitate around the conflict between RES producers and electrical companies. Stakeholders have different proposals, and most of them were presented in April during an energy forum in Sofia.

The industry association (APEE) made a formal (and unsuccessful) proposal to the Ministry of Economy and Energy (on 14/05/2009), asking for the creation of a RES agency that would handle the investors' problems. APEE also objected in court some parts of the Grid Access Act, which allow electricity companies to examine a RES production facility and its capacity prior to grid connection (according to the Energy Law, all RES connection is mandatory).

The transmission system operator made three different proposals concerning RES (but mainly targeting wind). First, the TSO wants a 20% quota on RES electricity production, because of the unpredictable grid load. A second option is the mandatory creation of a back-up energy source, such as gas stations for wind parks. The third proposal is that all RES parks should have output schedules, and any deviations from the plan it would have to be compensated by purchases on the balancing energy market.

The State Energy and Water Regulatory Commission proposed a schedule for connection of RES parks in order to handle the uncontrolled investors' interest. So far, a total of 11GW RES projects have been submitted, while during the record peak load in Bulgaria, measured in January, used less than 8GW.

The transmission and distribution companies asked for passing some of the costs for RES to their clients, by introducing a "RES fee" in the monthly bills. This proposal has been approved and retail electricity prices will increase by 5% from July.

However, it is unclear whether the other recommendations will be implemented. Recently, MoEE, NEC, and the EDCs have created a committee to make proposals to the government on how to change current legislation (which will likely be reviewed by the end of the year).

5. PROJECT ECONOMICS

5.1. Profitability with 70% debt and 30% equity

In order to illustrate the estimated profitability from a PV park, we will use a hypothetical case study. Our sample PV project is based in Sandanski, in the south-western part of Bulgaria, in Zone 3 (highest irradiation potential). We will review each component of the investment decision and present our assumptions.

5.1.1. Assumptions

Proposed case power system

We will base our models on a 6MW photovoltaic park, equipped with locally-produced cells. We have selected a park of this size for two reasons. First, it will require an initial investment, high enough to qualify for EU funding (see next section). Second, considerable discounts could probably be negotiated with the Bulgarian producer SolarPro (who claims total 18MWp annual production).

Indicator	Value	Comment
Location	Sandanski	Zone 3 (41°34'N 23°17'E)
Power capacity	6 MWp	A project of this size is eligible to apply for EU funding (see section 0)
Manufacturer	SolarPro	SolarPro is the only Bulgarian manufacturer of solar modules. Prices of equipment are likely to be below those of imported modules. We assume static modules from amorphous silicon.
Estimated electricity exported to grid annually	7,884 MWh	Estimate based on module type and location – 1,314MWh/kWp for the first year. Assuming 0.5% deterioration in output due to aging.
Electricity export rate	€386.03/MWh	The lower of the two feed-in tariffs is enforceable, since the capacity is >5kWp

CO_2 emission analysis

In addition to electricity, revenue is available through the sale of Certified Emission Reduction (CER) futures. Although CER prices on the European Climate Exchange dropped by 46% (12/09 delivery) since their peak in 2008, income from CO_2 reduction remains attractive.

Indicator	Value	Comment
Net annual GHG emission reduction	1388 tCO_2	Certified Emission Reduction (CER) figures, available for sale under the Kyoto program
GHG reduction credit rate	€ 15.50 / tCO_2	CER futures contract, tradable on ECX. Average price for the last year (15 May 2008-2009). December 2009 delivery. We will assume CER price grow by the rate of the FIT growth
GHG reduction credit duration	25 years	Assuming CER futures are sold throughout the entire project life

Financial parameters

In this section we review financial parameters used during analysis. Initial costs are based on own research and calculations. This sample project is with a 70:30 debt to equity ratio; for different capital structures, please refer to the appendix.

Indicator			Value	Comment
Growth			5.5%	Based on the latest increase in feed-in tariffs.
Project life			25 years	Project is life is equal to the guaranteed feed-in period
Debt to equity			70:30	Sample 70:30 debt to equity ratio. Results with 50:50 and 30:70 capital structure are in the appendix
Cost of equity			5-10%	We present results with a 5% and 10% cost of equity.
Cost of debt			1-10%	We present results with a 1-10% interest rate band. Debt term is 25 years, tax rate is 10%.
Weighted average cost of capital			2.13 -9.30%	Tax-adjusted WACC varies according to the cost of debt and cost of equity in the 70:30 capital mix.
EU grant or discount from manufacturer			0-50%	We present results with a 0-50% EU grant based on total initial investment. This section can also be interpreted as a "discount on equipment due to size of order", or a mixture of grant and discount
Expenses	Year 0	Equipment	€ 4,250,000	Latest SolarPro prices are of €4-4.5/Wp. Straight-line depreciation over 25 years, no salvage value.
		Land	€ 11,475	1000m^2 agricultural land sell for an average of €255. 1MWp installed capacity requires an area of approximately 45 da.
	Year 1 - 25	Insurance	0.5%	Experts claim PV annual insurance premium is 0.5-1% of equipment value (less accumulated depreciation)
		Maintenance	€17,082	Using the regulator's suggested maintenance of €0.013/kWh

5.1.2. Results

Profitability results (presented in the next two pages), vary significantly with the cost of capital. Inexpensive loan rates are necessary for a PV project with such a capital structure to be profitable, unless EU funding or equipment discount is negotiated. However, profitability with different capital structures can be higher (results for 50:50 and 30:70 are presented in sections 8.4 and 8.5).

Chart 9: Simple payback period

Results based on nominal cash flows during the 25y life

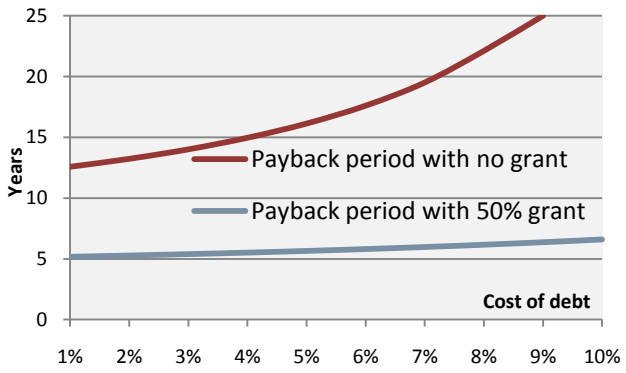


Table 7: Profitability measures at varying cost of capital and 0-50% grant levels

Cost of equity	Cost of debt	WACC	EU grant: 0% of initial value			EU grant: 50% of initial value		
			IRR	NPV	Payback	IRR	NPV	Payback
5%	1%	2.13%	5.80%	€ 11,478,790.58	12.58	18.557%	€ 31,248,847.31	5.18
5%	2%	2.76%	5.28%	€ 7,344,501.21	13.23	18.162%	€ 27,459,139.64	5.28
5%	3%	3.39%	4.70%	€ 3,567,924.17	14.01	17.738%	€ 24,015,605.35	5.40
5%	4%	4.02%	4.06%	€ 113,984.72	14.96	17.286%	€ 20,881,489.79	5.52
5%	5%	4.65%	3.37%	-€ 3,048,190.02	16.13	16.807%	€ 18,024,587.87	5.66
5%	6%	5.28%	2.61%	-€ 5,945,948.55	17.60	16.302%	€ 15,416,569.04	5.81
5%	7%	5.91%	1.78%	-€ 8,603,665.11	19.51	15.772%	€ 13,032,415.06	5.98
5%	8%	6.54%	0.85%	-€ 11,054,684.83	22.11	15.218%	€ 10,849,952.50	6.17
5%	9%	7.17%	-0.23%	-€ 13,333,280.91	>25.00	14.641%	€ 8,849,464.33	6.38
5%	10%	7.80%	-1.50%	-€ 15,465,434.98	>25.00	14.042%	€ 7,013,366.67	6.61
Cost of equity	Cost of debt	WACC	EU grant: 0% of initial value			EU grant: 50% of initial value		
			IRR	NPV	Payback	IRR	NPV	Payback
10%	1%	3.63%	5.80%	€ 5,989,587.45	12.58	18.557%	€ 24,673,878.60	5.18
10%	2%	4.26%	5.28%	€ 2,627,605.08	13.23	18.162%	€ 21,637,628.31	5.28
10%	3%	4.89%	4.70%	-€ 468,424.28	14.01	17.738%	€ 18,859,869.96	5.40
10%	4%	5.52%	4.06%	-€ 3,322,858.02	14.96	17.286%	€ 16,314,495.34	5.52
10%	5%	6.15%	3.37%	-€ 5,957,157.27	16.13	16.807%	€ 13,978,571.35	5.66
10%	6%	6.78%	2.61%	-€ 8,390,377.03	17.60	16.302%	€ 11,831,863.29	5.81
10%	7%	7.41%	1.78%	-€ 10,639,563.05	19.51	15.772%	€ 9,856,437.74	5.98
10%	8%	8.04%	0.85%	-€ 12,728,490.65	22.11	15.218%	€ 8,036,333.34	6.17
10%	9%	8.67%	-0.23%	-€ 14,683,124.02	>25.00	14.641%	€ 6,357,288.40	6.38
10%	10%	9.30%	-1.50%	-€ 16,526,199.25	>25.00	14.042%	€ 4,806,515.79	6.61

Chart 10: IRR at 0-10% cost of debt

Results based on 0-50% EU grant and 0-10% cost of equity. Profitable projects lie above WACC

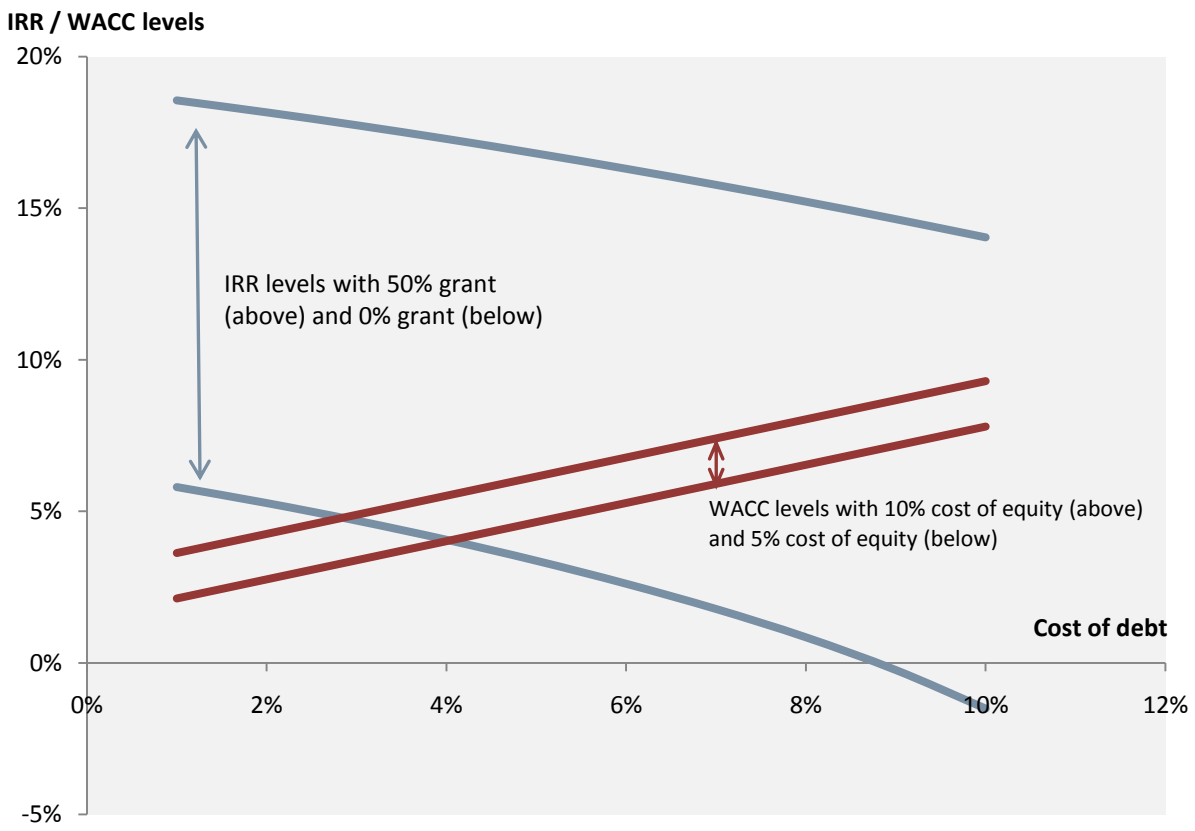
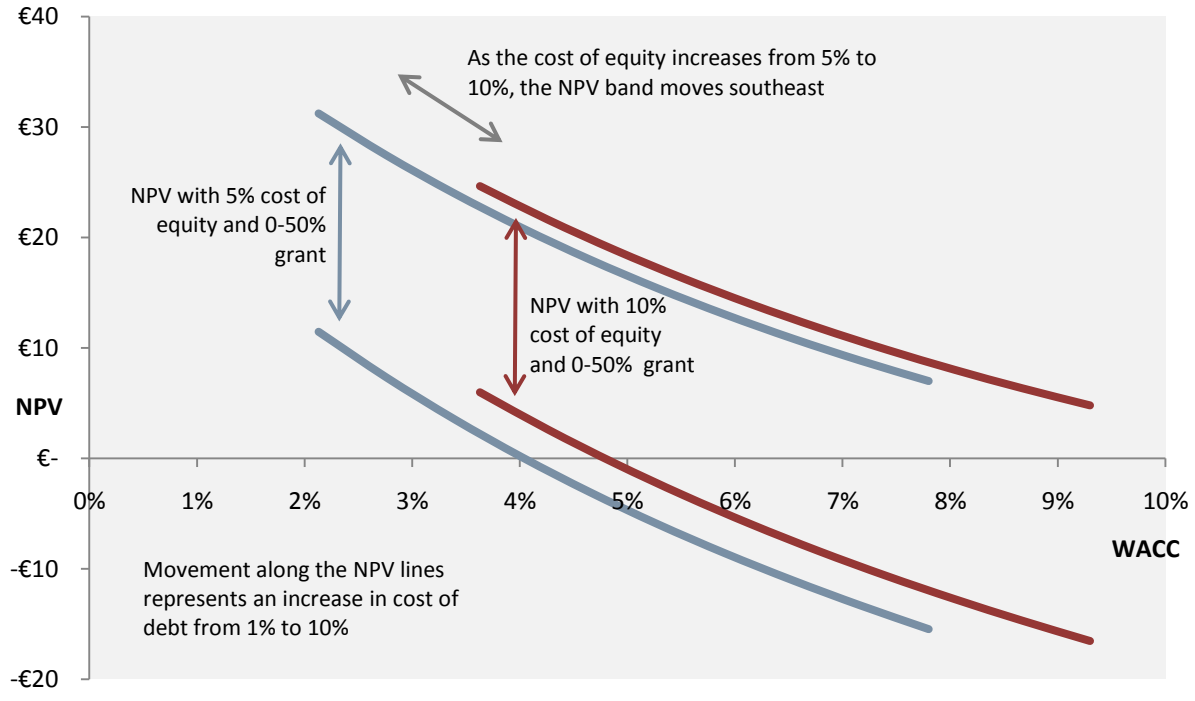


Chart 11: Net present value 0-10% cost of debt (in millions of EUR)

Results based on 0-50% EU grant, 5-10% cost of equity, and 1-10% cost of debt



5.2. Project Financing

Obtaining funding for a large-scale photovoltaic park in Bulgaria can be difficult. Before the economic crisis, commercial banks were widely used for small projects, but credit is no longer easy to access. Generally, RES funding is concentrated around small-scale projects. For larger investments, the following sources can be considered:

Local government

State subsidies for photovoltaics (by means other than feed-in tariffs) are generally scarce. Available funding for RES is primarily for hydroelectric power. There is extensive funding for ecology projects, which generally concentrate on issues such as promoting and maintaining biodiversity, waste recycling, etc. PV energy as a way to reduce air pollution does not qualify as a valid application for these grants.

Municipal funding for such projects is in the form of Public Private Partnerships. In PPPs, local authorities participate in the joint venture by supplying the land for the project. Then the two parties receive shares corresponding to their contribution. The value of the land is estimated by auditors, hired by the municipality.

Joint Assistance to Support Projects in European Regions

JASPERS is a technical support facility, helping new EU members prepare projects for assistance under the European Regional Development Fund and Cohesion Fund. The program is run by the European Commission (DG Regional Development), the European Investment Bank, and EBRD. JASPERS opened an office in Sofia in April 2009.

JASPERS is targeted at very large-scale projects – the minimum is €25,000,000). Local coordinator is the Ministry of Economy, which in April announced the inclusion of RES projects in the program (previously it was infrastructure and waste). So far 8 projects have been completed under JASPERS.

European Bank for Reconstruction and Development

EBRD has offered strong financial support for the development of the Bulgarian RES sector. Small-scale projects normally used the Bulgarian Energy Efficiency and Renewable Energy Credit Line, offered from EBRD through several local banks. After BEERCL was renewed in April 2009, photovoltaic projects are no longer eligible for loans. However, large-scale projects can apply directly to EBRD, separately from the BEERCL program.The application process has several stages:

- The applicant submits a business plan to the local EBRD office;
- The EBRD Operations Committee approves the project concept and overall structure, including proposed financing scheme and supporting obligations;
- The parties sign a mandate letter, outlining the project plan, development expenses and responsibilities. The basic business deal (including a signed term sheet) has been negotiated.
- Any investigations required by EBRD have been substantially completed.
- The Operations Committee gives a final review of the project.

- The EBRD president presents the project to the Board of Directors for approval. The board signs the deal and it becomes legally binding.
- Payment. Once repayment conditions are agreed and the Bank's conditions met, the funds are transferred to the client's account[17]

Trading CO_2 emissions reduction futures

Certified Emission Reduction units (CER) can be used as a potential source of revenue under UN's Joint Implementation scheme. Bulgaria is a part of the JI scheme and currently has carbon trading agreements with seven countries. The partners and their assigned minimum required quantity ERUs are the following: Japan (50,000); Netherlands (20,000), Denmark (30,000), Austria (50,000), World Bank Carbon Finance Fund (50,000), Sweden, and Switzerland.

The Joint Implementation program is valid until 2012. Prices are negotiated between the two parties, while on the ECX the average price of a carbon credit (Dec 09 delivery) for the last year is €15.50 (15 May 2008-2009).

Unicredit Bulbank - PV plant investment loan

Unicredit Bulbank is the only bank that has a loan scheme specifically for photovoltaic projects. Under the contract terms, the loan can cover up to 90% of the equipment cost and have a duration up to 15 years. Maximum loam amount is not disclosed, but interest is speculated to be around 12.5%. One peculiarity of the scheme is that it is developed in coordination with SolarPro, the Bulgarian producer of PV modules, and requires equipment purchases from this company.

European Agricultural Fund for Rural Development

This fund is dedicated mainly to small-scale projects. EU funding under the Rural Development Program 2007-2013 (Measure #321) is capped at the lower of 70% of project cost, or €500,000. However, if the grant receiver is a municipality, funding can be up to €3,000,000. This is the measure three companies used in partnership with local municipalities (in Stara Zagora, Tervel, etc.).

6. ADMINISTRATIVE PROCESS

The administrative process necessary for a large-PV park can be cumbersome and slow, with a suggested timeframe between 1 and 2 years. The following list explains the administrative process in chronological order:

1. Firm registration. As foreign citizens cannot own land in Bulgaria, an LLC needs to be established to purchase the land.
2. Land purchase.
3. Environmental Impact Assessment, proving Natura 2000 conformity (see section 4.3). The EIA is administered by the Regional Inspectorates of Environment and Water, and we recommend frequent consultations with them during preparation. The formal proposal for EIA (paid by the producer) contains the following documents:
    - Annotation of the investment proposal
    - Alternatives for location, with layouts and coordinates
    - Description of the environmental components and cultural heritage (if any)
    - Description of the project's impact on the above mentioned points
    - Information about the used forecast methodology
    - Description of measures that could decrease harmful impact on the environment
    - Statements and opinion of the affected community and states
    - Experts' conclusions
    - Non-technical résumé
    - Description of the difficulties (technical or related to data gathering) in the process of drafting of the EIA
    - Any other information that the RIEW might request
4. Land status change (if necessary). If the purchased parcel is a forest or agricultural land, it needs to be changed to industrial.
    - Agricultural land is regulated either by the Agricultural Lands Commission at the Ministry of Agriculture and Foods (for parcels above 50da) or by the regional "Agriculture and Forests" inspectorates (for parcels below 50da). In all cases, the mayor of the local municipality needs to be contacted to include the area into the construction borders of the populated areas.
    - Forestry also requires a status change. The formal permission to exclude the land from the national forestry fund is given by the Forests National Management.
5. Obtaining a designer visa. This is an official permission granted by the regional chief municipal architect to start an architectural project of a certain type (PV park) on a specific location. This is not a building permit, but the first step in the creation of the architectural project that will be used when applying for a building permit.
6. Request for a grid connection study. This is submitted to the closest electrical company (one of the private EDCs or NEC).
7. Preliminary contract for grid connection with the electrical company.

8. Land study for solar resource potential. Estimation of output, solar irradiation, technology.
9. Obtaining electricity production permit from SEWRC (only for projects with > 5MWp installed capacity).
10. Submission of architectural project, leading to a construction permit. The architectural project is a combination of several expert reports, sent to the local municipality. The following documents compose the architectural project:
    - Designer visa
    - Geological, seismological, and geotechnical characteristic of the region
    - Proposal for connection to the supply infrastructures for gas, water, electricity, heat, roads, or any other type of grid, specific to the construction
    - Geodesic map and cadastral ground
    - Overview of cultural heritage present at the site (if any), supported by document from the archeological cadastre
    - Volumetric-structural research of the site
    - Anything else the municipality might request
11. Final contract for connection with the electrical company
12. Construction of the park.
13. 72 hours testing period after installation is complete.
14. Obtaining operation permit (Act 16). This is a universal requirement for all constructions.
15. Contract for grid access.
16. Contract for electricity purchase.

7. CONCLUSION

This report analyzed the economics, the public policy, and the regulatory risks in the Bulgarian photovoltaic electricity sector. Our analysis based on primary-source information, interviews, case studies, and desk research finds the following advantages of the Bulgarian PV sector:

The favorable feed-in tariffs. The preferential rates are several times higher than the average sale price of 1 MWh. Feed-in tariffs are secured for 25 years and it is very likely they will be revised upwards. In addition, PVs has a priority grid access, so there will be no waste of production hours. Although not guaranteed, it is highly probable that this favorable regulatory environment will be extended after 2011. Otherwise, the government risks losing investors' interest.

The RES targets set by the EC. The Commission will possibly impose its RES objectives on Bulgaria by threatening to suspend subsidies. Bulgaria has so far received the strictest sanctions by EU ever imposed on a member state[18]. It is likely that the new government will try to improve the country's tarnished image by complying with the RES share targets.

The high solar electricity potential. Estimates show that output from 1MWp capacity can easily reach more than 1,500kWh annually. Also, high irradiation can sometimes be found on altitudes and terrains unsuitable for agriculture. In such cases, owners and municipalities would be motivated to sell or lease land that would otherwise generate little or no income.

The attractive economics of the investment. PVs require high initial investment, but have very low expenses afterwards. Profitability largely depends on preferred capital structure and cost of capital; under favorable conditions, a project can be repaid in less than 5 years, leaving 20 years generating net profit. Additionally, large projects are eligible to apply for EU funding through the new JASPERS scheme, and could possibly benefit from high discounts from local manufacturers. The combination of favorable regulation and good solar conditions result in annual sales of nearly €490,000/MWp.

8. APPENDIX

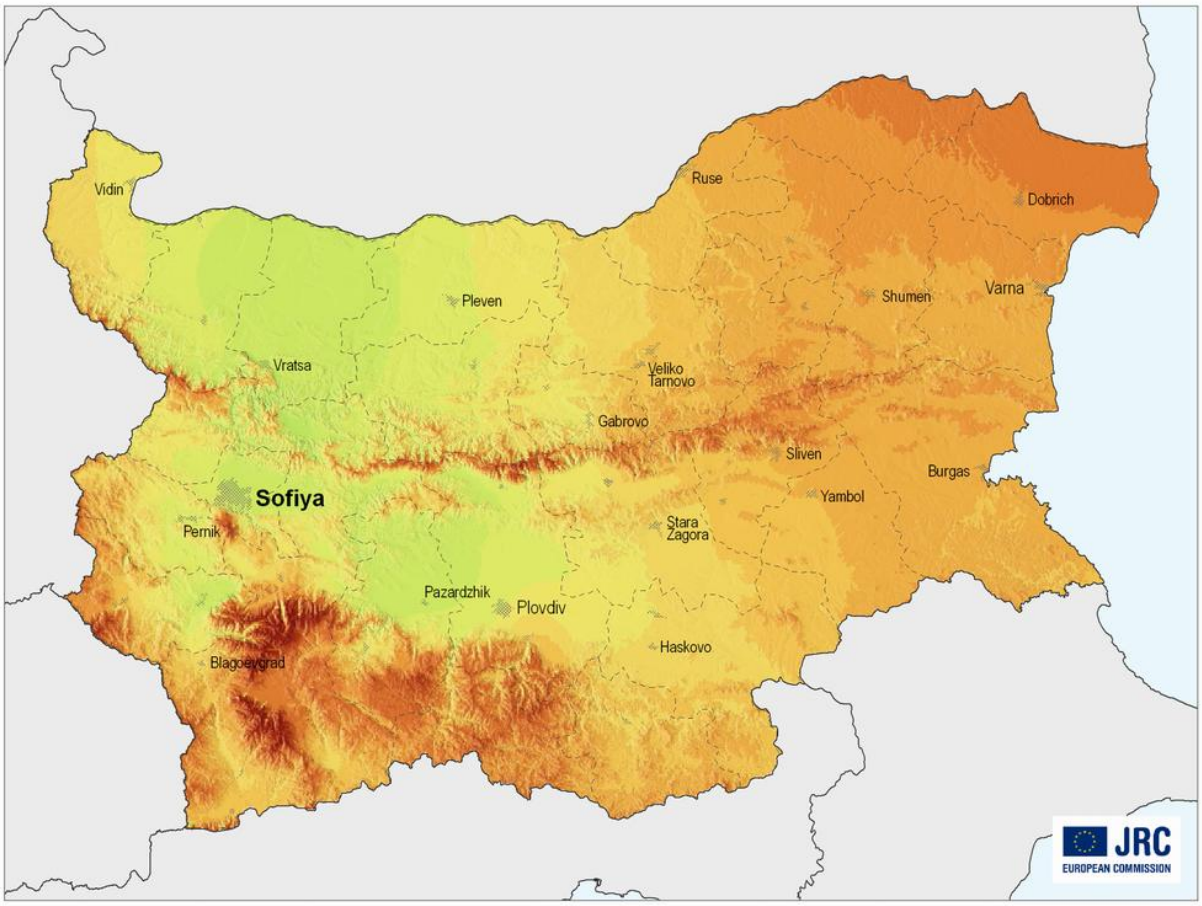
8.1. Bulgarian energy balance sheet (2007)

Energy balance sheet , in 1000 toe													
	Primary production	Recovered products	Imports	Stock change	Exports	Bunkers	**Gross inland consumption**	Transformation input	Transformation output	Exchanges, transfers, returns	Consumption of the energy branch	Distribution losses	**Available for final consumption**
Coal	**4,773**	32	2,877	- 40	1	-	**7,642**	7,153	-	-	-	3	**487**
Fuels of coal	**-**	3	186	6	-	-	**193**	939	1,195	-	154	-	**295**
Natural gas	**236**	-	2,753	21	-	-	**3,010**	1,002	-	-	333	45	**1,630**
Crude oil and feedstock	**26**	-	7,259	- 40	124	-	**7,121**	7,384	124	141	-	-	**3**
Petroleum products	**-**	-	1,614	- 27	3,709	52	**- 2,175**	174	7,017	- 136	241	-	**4,291**
Biomass	**689**	19	-	- 8	25	-	**675**	-	-	-	-	-	**675**
LHP and RES	**286**	-	-	-	-	-	**286**	-	-	- 251	-	-	**35**
Nuclear heat	**3,728**	-	-	-	-	-	**3,728**	3,728	-	-	-	-	**-**
Other fuels and industrial waste	**-**	68	-	-	-	-	**68**	2	-	-	-	-	**66**
Electricity	**-**	-	263	-	648	-	**- 385**	-	3,440	251	538	403	**2,365**
Derived heat	**-**	-	-	-	-	-	**-**	-	1,246	-	297	139	**811**
Total	**9,738**	**122**	**14,952**	**- 88**	**4,507**	**52**	**20,163**	**20,382**	**13,022**	**5**	**1,563**	**590**	**10,658**

Source: NSI

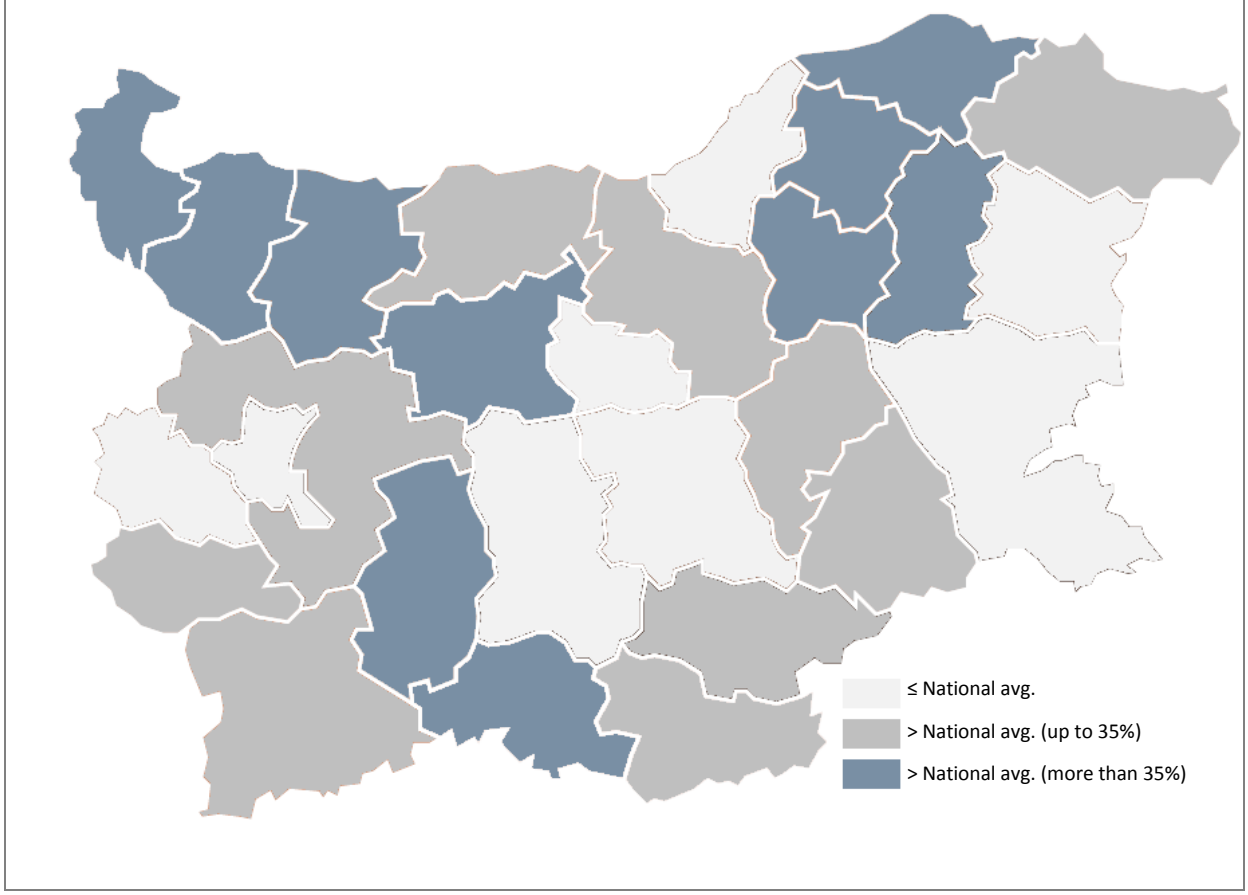
8.2. Solar potential with optimally inclined modules

Solar electricity potential



8.3. National unemployment levels

Unemployment levels by municipality, as of 31 March 2009. National average – 6.88%



Source: National Employment Agency, Ministry of Labour and Social Policy

8.4. Profitability with 50% debt and 50% equity

Chart 10: Simple payback period

Results based on nominal cash flows during the 25 year project life

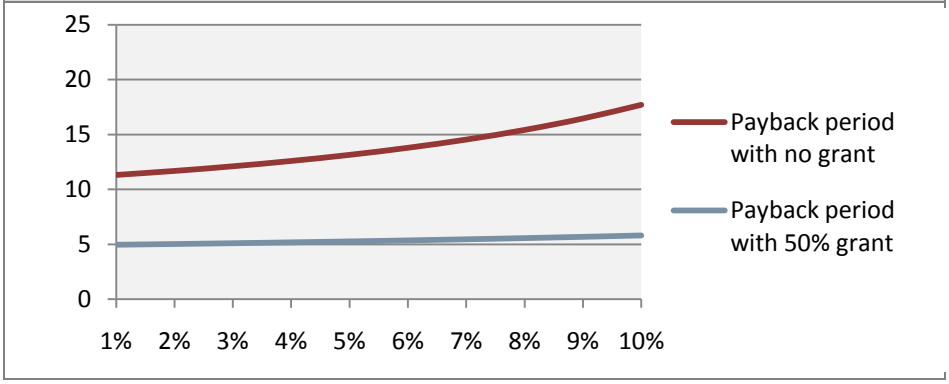


Table XXX: Profitability measures at varying cost of capital and 0-50% grant levels

Cost of equity	Cost of debt	WACC	EU grant: 0% of initial value			EU grant: 50% of initial value		
			IRR	NPV	Payback	IRR	NPV	Payback
5%	1%	2.95%	6.94%	€ 11,965,478.58	11.34	19.435%	€ 29,283,894.20	4.97
5%	2%	3.40%	6.58%	€ 9,112,440.69	11.71	19.155%	€ 26,764,418.59	5.03
5%	3%	3.85%	6.19%	€ 6,412,606.33	12.13	18.855%	€ 24,396,910.14	5.11
5%	4%	4.30%	5.78%	€ 3,858,095.26	12.61	18.536%	€ 22,171,219.20	5.19
5%	5%	4.75%	5.33%	€ 1,441,765.57	13.16	18.199%	€ 20,078,136.37	5.27
5%	6%	5.20%	4.85%	-€ 842,979.02	13.81	17.844%	€ 18,109,239.27	5.37
5%	7%	5.65%	4.33%	-€ 3,002,340.78	14.55	17.473%	€ 16,256,765.96	5.47
5%	8%	6.10%	3.78%	-€ 5,042,241.01	15.43	17.087%	€ 14,513,512.90	5.58
5%	9%	6.55%	3.20%	-€ 6,968,399.06	16.46	16.685%	€ 12,872,754.80	5.70
5%	10%	7.00%	2.57%	-€ 8,786,382.39	17.71	16.271%	€ 11,328,183.04	5.82
Cost of equity	Cost of debt	WACC	EU grant: 0% of initial value			EU grant: 50% of initial value		
			IRR	NPV	Payback	IRR	NPV	Payback
10%	1%	5.45%	6.94%	€ 3,653,365.61	11.34	19.435%	€ 19,921,729.59	4.97
10%	2%	5.90%	6.58%	€ 1,602,954.66	11.71	19.155%	€ 18,151,724.62	5.03
10%	3%	6.35%	6.19%	-€ 356,531.89	12.13	18.855%	€ 16,474,479.62	5.11
10%	4%	6.80%	5.78%	-€ 2,228,655.59	12.61	18.536%	€ 14,884,541.76	5.19
10%	5%	7.25%	5.33%	-€ 4,016,567.05	13.16	18.199%	€ 13,376,985.80	5.27
10%	6%	7.70%	4.85%	-€ 5,723,144.29	13.81	17.844%	€ 11,947,314.12	5.37
10%	7%	8.15%	4.33%	-€ 7,351,103.35	14.55	17.473%	€ 10,591,373.82	5.47
10%	8%	8.60%	3.78%	-€ 8,903,081.55	15.43	17.087%	€ 9,305,290.16	5.58
10%	9%	9.05%	3.20%	-€ 10,381,695.76	16.46	16.685%	€ 8,085,415.12	5.70
10%	10%	9.50%	2.57%	-€ 11,789,578.77	17.71	16.271%	€ 6,928,289.13	5.82

Chart 8: IRR at 0-10% cost of debt

Results based on 0-50% EU grant and 0-10% cost of equity. Profitable projects lie above WACC

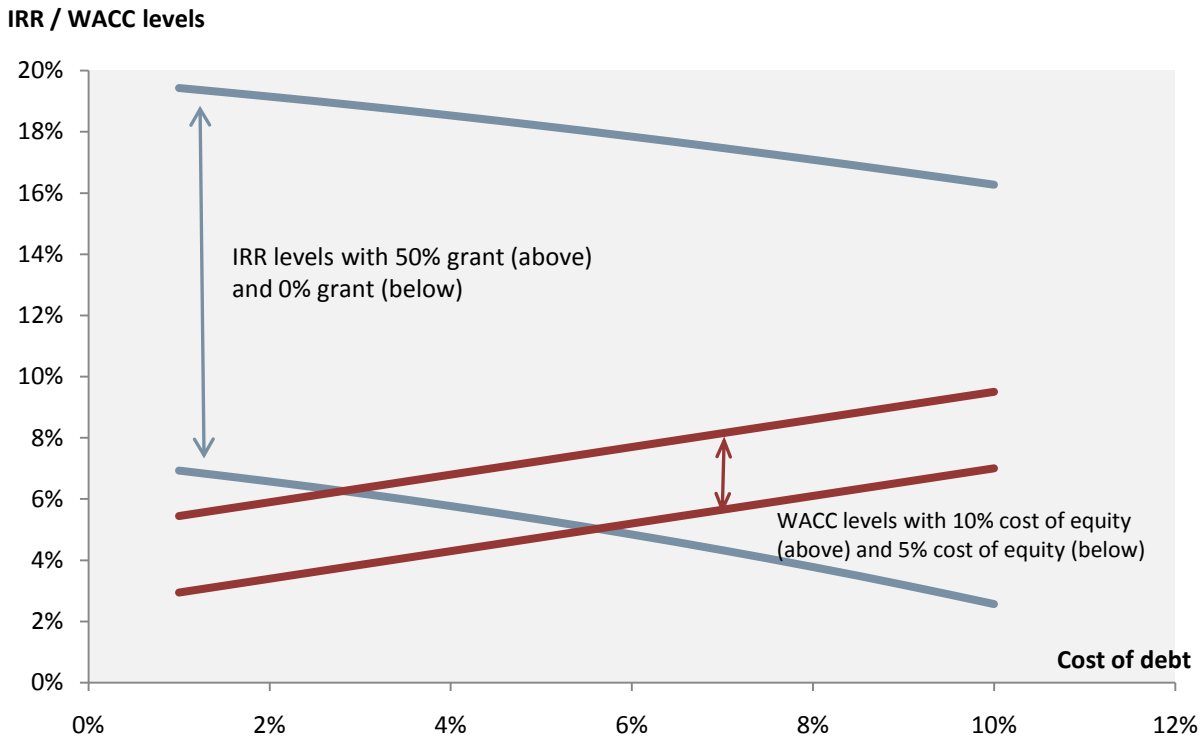
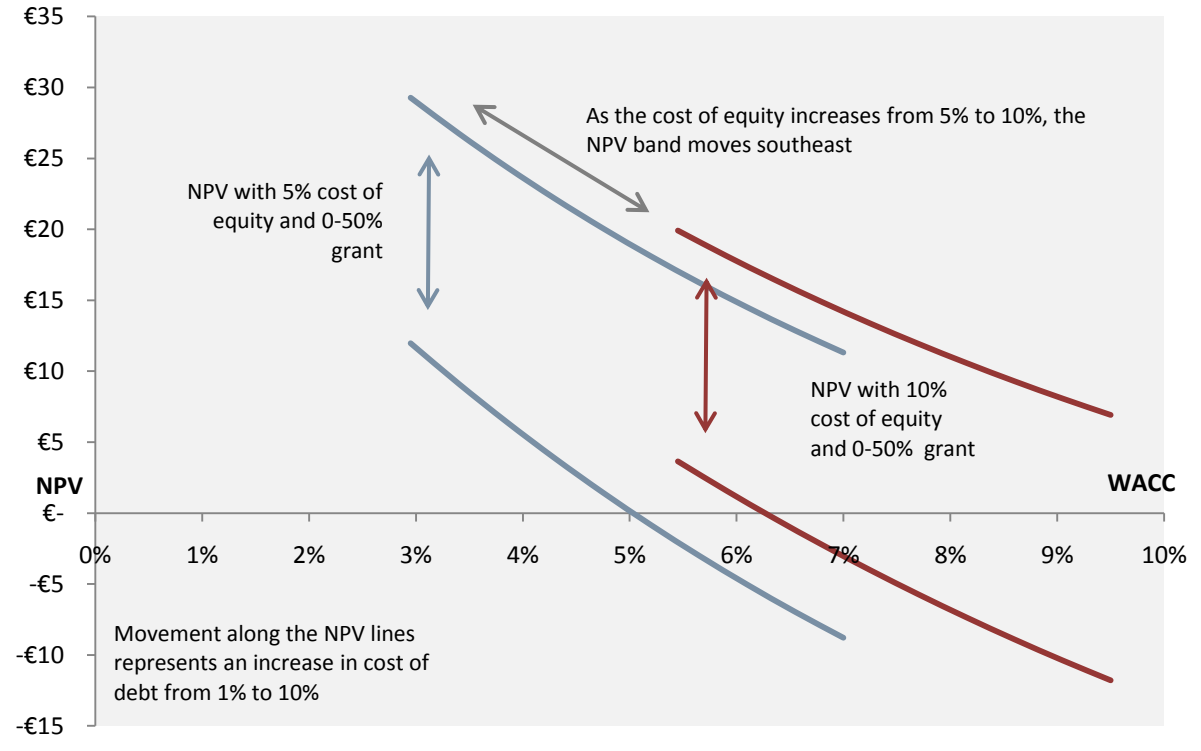


Chart 9: Net present value 0-10% cost of debt (in millions of EUR)

Results based on 0-50% EU grant, 5-10% cost of equity, and 1-10% cost of debt



8.5. Profitability with 30% debt and 70% equity

Chart 10: Simple payback period

Results based on nominal cash flows during the 25y

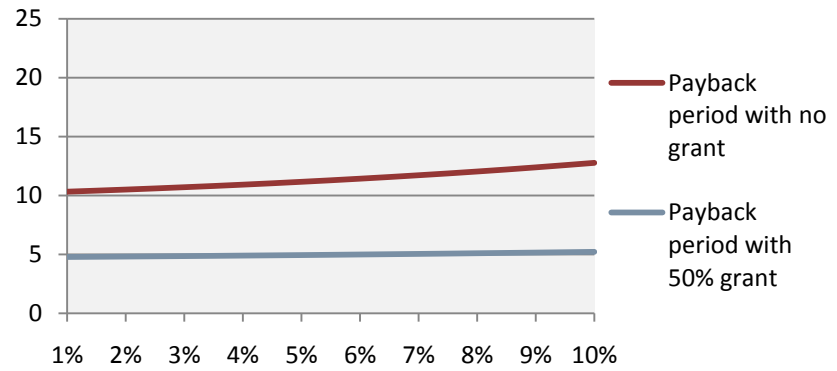


Table XXX: Profitability measures at varying cost of capital and 0-50% grant levels

Cost of equity	Cost of debt	WACC	EU grant: 0% of initial value			EU grant: 50% of initial value		
			IRR	NPV	Payback	IRR	NPV	Payback
5%	1%	3.77%	8.02%	€ 12,215,287.33	10.33	20.305%	€ 27,473,931.03	4.77
5%	2%	4.04%	7.81%	€ 10,566,795.14	10.51	20.139%	€ 26,065,457.14	4.81
5%	3%	4.31%	7.59%	€ 8,954,201.02	10.71	19.960%	€ 24,698,937.05	4.85
5%	4%	4.58%	7.36%	€ 7,378,352.71	10.93	19.771%	€ 23,373,603.35	4.89
5%	5%	4.85%	7.11%	€ 5,840,202.72	11.17	19.571%	€ 22,088,807.46	4.94
5%	6%	5.12%	6.84%	€ 4,340,716.82	11.43	19.361%	€ 20,843,969.80	4.98
5%	7%	5.39%	6.56%	€ 2,880,796.82	11.72	19.142%	€ 19,638,537.44	5.04
5%	8%	5.66%	6.27%	€ 1,461,219.61	12.04	18.914%	€ 18,471,950.06	5.09
5%	9%	5.93%	5.97%	€ 82,592.84	12.39	18.678%	€ 17,343,614.55	5.15
5%	10%	6.20%	5.65%	-€ 1,254,673.41	12.77	18.435%	€ 16,252,887.74	5.21
Cost of equity	Cost of debt	WACC	EU grant: 0% of initial value			EU grant: 50% of initial value		
			IRR	NPV	Payback	IRR	NPV	Payback
10%	1%	7.27%	8.02%	€ 1,648,945.93	10.33	20.305%	€ 16,183,356.54	4.77
10%	2%	7.54%	7.81%	€ 590,118.32	10.51	20.139%	€ 15,304,798.57	4.81
10%	3%	7.81%	7.59%	-€ 455,109.26	10.71	19.960%	€ 14,445,775.34	4.85
10%	4%	8.08%	7.36%	-€ 1,485,636.10	10.93	19.771%	€ 13,606,257.48	4.89
10%	5%	8.35%	7.11%	-€ 2,500,273.58	11.17	19.571%	€ 12,786,289.75	4.94
10%	6%	8.62%	6.84%	-€ 3,497,811.22	11.43	19.361%	€ 11,985,956.29	4.98
10%	7%	8.89%	6.56%	-€ 4,477,074.04	11.72	19.142%	€ 11,205,350.33	5.04
10%	8%	9.16%	6.27%	-€ 5,436,969.56	12.04	18.914%	€ 10,444,549.18	5.09
10%	9%	9.43%	5.97%	-€ 6,376,523.50	12.39	18.678%	€ 9,703,594.93	5.15
10%	10%	9.70%	5.65%	-€ 7,294,904.52	12.77	18.435%	€ 8,982,480.72	5.21

Chart 8: IRR at 0-10% cost of debt

Results based on 0-50% EU grant and 0-10% cost of equity. Profitable projects lie above WACC

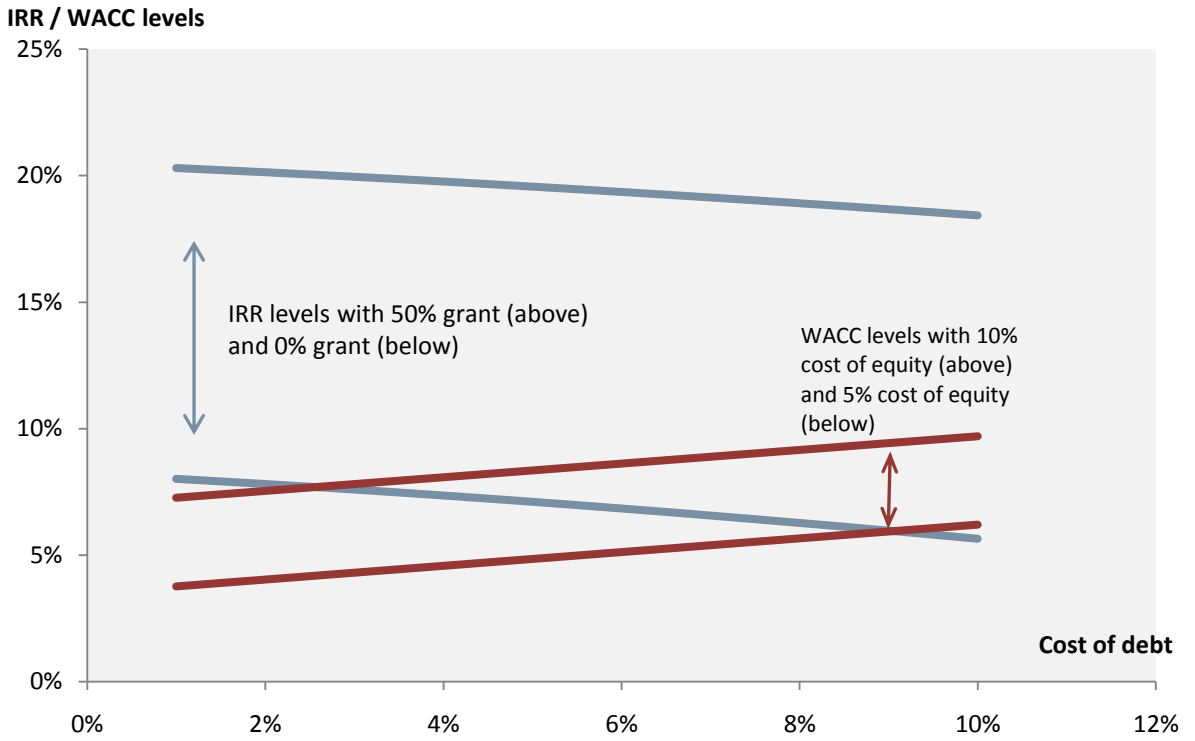
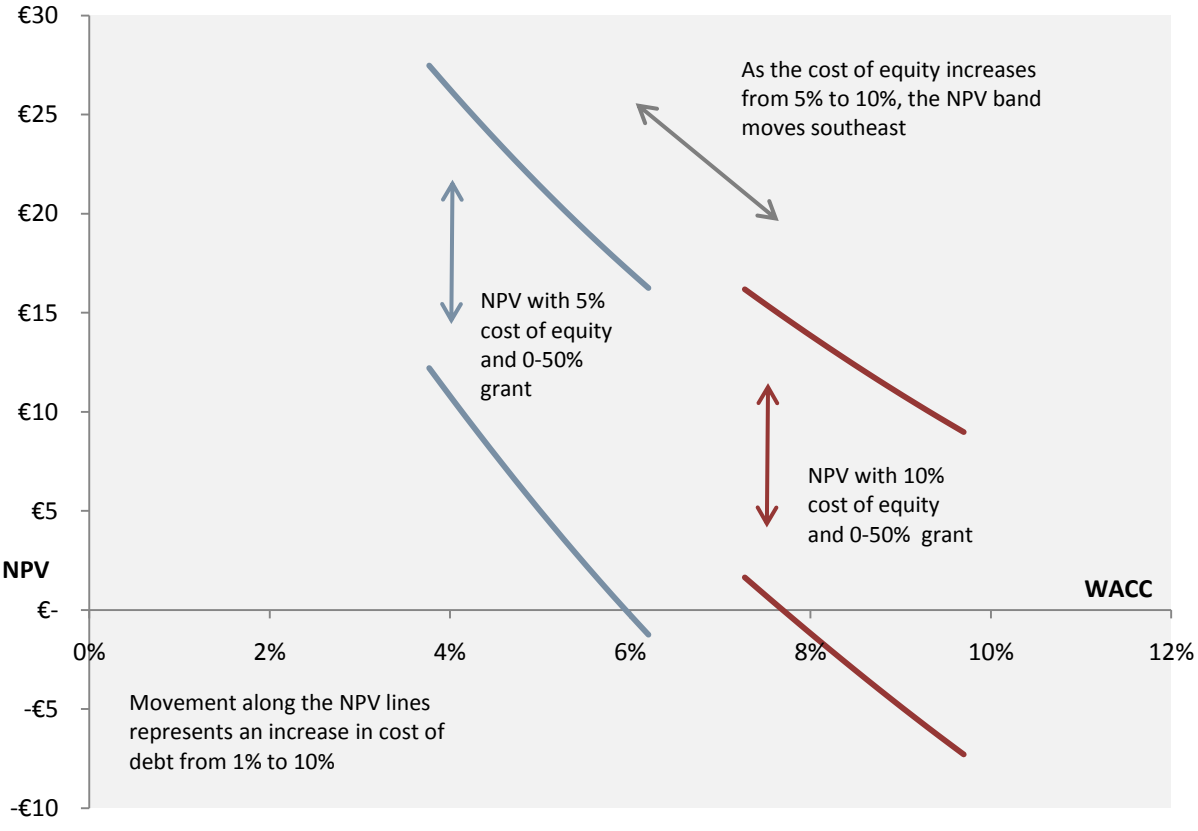


Chart 9: Net present value 0-10% cost of debt (in millions of EUR)

Results based on 0-50% EU grant, 5-10% cost of equity, and 1-10% cost of debt



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