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RENEWABLE ENERGY
PROJECTS WORLDWIDE

20555

DETAILED RESULTS FROM THE FEASIBILITY STUDY WIND PARK «ZATRIC» (30 - 45 MW) RAHOVEC, KOSOVO

With support from

REPIC (Renewable Energy Efficiency Promotion in International Cooperation)

Zurich, September 9th, 2013

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1. SUMMARY

Based on the promising results obtained by one of our previous wind measurement campaigns in Kosovo at Zatric, a small village on a mountain ridge near to the town of Rahovec, we decided to start the development of a 30 to 45 MW wind park at this location. Once realized, this would be **the first operational wind park of any significant size in Kosovo**. It can therefore be seen as a pilot project for further wind energy projects to follow. Although the Government of Kosovo expressed their ambition to promote the renewable energy sector within their country and set a **10 years fixed feed-in tariff for renewable energies**, the sector is still only very sparsely developed. While some hydropower projects have already been realised, no comparable wind energy projects exist within the country, from which a developer could learn precious lessons from. As it became evident to NEK, that there is not only one but a number of suitable sites with enough wind potential for the development of a wind park, they set forth to launch this pilot project, which will hopefully stimulate the wind energy sector in Kosovo. This feasibility study summarizes the results from the measurement campaigns and surveys carried out by us in the past years and was partly financed by **REPIC** (Renewable Energy Efficiency Promotion in International Cooperation), for which we are very thankful.

- In May 2012, we installed a **60 metre high meteorological (met) mast** at Zatric equipped with state-of-the-art sensors to get a precise picture of the prevailing wind conditions and make a reliable statement about the wind potential within the project perimeter. These measurements will eventually result in a bankable wind assessment, which is required as a firm decision basis for financing institutions. After the first few weeks, it became evident, that our wind data from the previous measurement campaign was accurate. The data from 1 year of measurements with the met mast shows an average extrapolated wind speed of approx. **7.0 m/s at a hub height of 100 m.**

- A thorough site investigation was carried out to determine the most suitable locations for the wind turbines within the project perimeter under consideration of the topographical constraints and the estimated wind potential. **15 turbine locations** were identified where wind turbines of the **3.0-MW class** will be installed.

- Through a **grid connection study**, a suitable feed-in point to the national grid was identified and the economically most feasible solution was determined, optimizing expected electrical losses through transformation and transport against costs for infra-

structure. The most suitable option is to collect the electricity produced from the wind turbines at the **35 kV** level at a collector point in the southern part of the project perimeter and to evacuate the electricity at the same voltage level via an overhead line to the next transformer station in Rahovec.

- An **environmental impact study**, conducted by a local environmental engineering company, showed, that **no major environmental impacts** are expected through the implementation and operation of the wind park. This assessment was augmented by further calculations and simulations carried out by NEK itself.

- **Transport of the turbine components** is possible by the route of **Durres, Albania, over Prizren, Kosovo, to Rahovec**. However, at some critical points, some adjustments to the existing roads have to be made, so that the larger components may pass. Along the route, a road tunnel was identified, where the allowed passing height is too limited. This study was carried out by the Romanian-German company Holleman Srl., which specializes in the transportation of exceptional loads.

- The **technical planning** of the wind park was concretizised, resulting in a proposed **access road, platform and turbine foundation layout**. This planning was supported by data from various site visits and a topographical survey carried out with GPS equipment. A geotechnical study and further topographical surveys are to follow.

- The **overall permitting process** for the wind park was initiated and various applications were handed-in to different authorities. This resulted, among others, in the **Preliminary Construction Authorization** from the Energy Regulatory Office **ERO,** the **Environmental Permit**, a **Grid Connection Offer** from the national electrical grid operator **KOSTT** and **contracts** for the required lands. The permitting process should be concluded towards the end of this year.

The main conclusion of this feasibility study is that a **45 MW** wind park with an estimated annual energy yield **of 115’000 - 125’000 MWh** can be implemented at the site Zatric and connected to the national grid. Because of the complex terrain, the wind park Zatric is a challenging project for development, logistics and construction.

Valuable **local know-how** was already acquired throughout this ongoing project development and will be enlarged through the next tasks to follow. We are confident that the wind park Zatric, when realized, will give the necessary impulses for **further project developments** and help to stimulate the renewable energy sector in Kosovo.

2. INTRODUCTION

NEK Umwelttechnik AG is a Swiss engineering company established in 1989 and focusing on the development of renewable energy projects worldwide. Beside solar and geothermal projects, we are also specializing in the engineering of wind parks of sizes up to several hundred MW.

In order to be with our developments as close to the market and to the population as possible, our philosophy is to establish in each country, in which the development of renewable energy projects is promising, own branches or affiliated companies. For the time being, we run such branches in Spain, Brazil, Canada, England, Romania, Ghana and in the meanwhile also in Kosovo.

In 2009, NEK Umwelttechnik AG started to evaluate the potential for the use of wind energy in Kosovo. A comprehensive feasibility study analysing the framework conditions in the country was conducted. The study was partially financed by REPIC, the interdepartmental platform of the Swiss Government to promote renewable energies in developing countries.

In the first phase, a preliminary study to identify general conditions for the development of wind energy projects in Kosovo was prepared, which included a comprehensive analysis of the legal and political framework as well as geographic and infrastructural conditions. In the second phase, a wind measuring campaign was conducted including wind measurements at 10 different sites in Kosovo to calculate a wind map for the country.

The conclusions from these two studies were used

- to decide, if wind energy developments in Kosovo are possible and profitable, and
- to identify the most suitable locations for potential developments.

Results from both phases were encouraging, and suggested that developments in the wind energy sector in Kosovo are not only possible, but necessary and highly desired by the government of Kosovo. The government has implemented the required policies to promote and realize wind energy projects in the country, such as a defined permitting procedure, feed-in tariffs and the procedure for power purchase agreements.

Taking into account the results of the wind measurements, local infrastructure, availability of space and distance to the grid, a suitable site, namely “Zatric”, was identified by NEK Umwelttechnik AG for further development.

As one of the main criteria for evaluating the economic feasibility of a wind park is accurate and reliable wind data, which furthermore can be used for a bankable wind assessment, the next step in the project development and evaluation of the selected site Zatric was to install a met mast with state-of-the-art measurement equipment. A 60 m met mast was successfully installed and taken into operation in May, 2012, and has since then delivered precise and faultless wind data.

It very soon became evident, that the already measured wind data from the previous campaign in Zatric was accurate, and the measurements continued to show very promising results. This was the starting point for carrying out a complete and state-of-the-art technical and economical feasibilty study, which in the end effect will lead to a fully permitted wind park with all necessary documentations. This report summarizes the main conclusions by:

- providing a comprehensive overview of the prevailing wind conditions as measured by the installed met mast and offering energy yield calculations.
- describing the definite layout of the wind park, providing an access road solution for the transport of the wind turbines and visualizing some results from a topographical land survey.
- defining the feed-in point into the national electrical grid and the optimal voltage level.
- summarizing the main conclusions from an environmental impact assessment for the Wind Park Zatric, which was carried out by a local engineering company.
- presenting the legal framework and administrative procedures that have to be passed through in order to obtain all required authorizations and premits.

This feasibility study and especially the installation of the met mast was partly financed and supported by REPIC (Renewable Energy & Energy Efficiency Promotion in International Cooperation) and at this point we want to thank REPIC for their contribution.

3. BACKGROUND

3.1. GENERAL

Kosovo is a nation in transition that has a high level of poverty, low educational attainment and a government that is seeking foreign expertise and investment to aid its developments. Renewable energy is an economic development activity that is particularly favoured by the government, given the energy crisis in the country. In addition, the desire to accede to the EU brings recognition of the need for renewable energy generation in the nation to meet EU standards. The government’s lack of capital to pursue renewable energy projects appears to drive their interest in reducing barriers for investments.

3.2. ENERGY SECTOR

3.2.1. Conventional Energy Sources

Kosovo’s main provider and producer of energy is the local operator KEDS. The two lignite power plants of KEDS produce around 98% of the energy used in the country and have an installed capacity of around 850 - 900 MW. Kosovo A (345 MW, 40 years old) is in poor condition and is said to be the worst single-point source of pollution in Europe. It is proposed to be shut down in the years to come: Kosovo A shall be decommissioned by 2017 to comply with the EC Treaty to which Kosovo is a signatory. Kosovo B (540 MW, 27 years old) needs rehabilitation to meet EU environmental standards.

Outages in generation and power shortages hurt household and economy dramatically throughout Kosovo. Frequent load shedding has constrained peak demand and muted the seasonal (winter) and daily peaks. KOSTT, the transmission system operator, has estimated that in the past years, annual electricity demand would have been 200 - 400 GWh higher in the absence of load sheddings.

Most electricity demand in Kosovo is residential (approx. 55%), followed by commercial and industry. Technical and non-technical losses in the network remain high, together representing roughly 40% of gross electricity consumption.

Imports of electricity via regional interconnections have been important to Kosovo over the past years. Net imports have ranged between 10 and 20%, but are insecure due to different reasons.

An analyses of the supply-demand balance shows that Kosovo needs about 950 MW of new, firm electricity capacity by 2017. This need grows to about 1’000 MW by 2019 and about 1’500 MW by 2025. There is a huge debate ongoing whether a new lignite power plant (Kosovo C), having 2 x 300 MW installed power, shall be planned and implemented in Kosovo. But concerns like high costs, damage to health due to the emissions, EC Treaty, opposition of population, and so on will most likely delay or even stop these plans to construct a new lignite power plant in Kosovo.

Therefore, Kosovo needs a mix of renewables and thermal to meet its demands for peaking and base-load capacity.

3.2.2. Renewable Energy Sources

Hydropower: Only few smaller size hydropower plants have been installed so far, but in the last few years quite some activity in this sector can be noted with new projects being proposed and possibilities investigated for run-of-river hydroplants as well as high-pressure hydroplants ranging from plants with a capacity of 2.2 MW up to 57.8 MW. Currently, in the applications register of the Energy Regulatory Office (ERO), hydropower is the pre-dominant renewable energy source applied for. How many of these hydropower projects will be realized in the end effect is among other things also dependent on the technical and economical feasibility of the individual projects and the ability to secure financing.

Solar energy: So far, there is no solar energy park installed in Kosovo nor any application for one pending at the Energy Regulatory Office. Solar energy usage is restricted to some solar panels on single buildings and these are only intended for the own power consumption meaning that none of the electricity produced is fed into any distribution grid. Although Kosovo shows some limited potential for this renewable energy source due to it’s dry climate in summer and high number of sunshine hours in that season, no major developments can be noted in that sector.

Wind energy: So far, no wind park is connected to the grid in Kosovo. In the past years, some second hand turbines were installed making up a potential capacity of roughly 2 MW, but due to different reasons, these turbines do not produce electricity.

The ***potential for wind energy projects in Kosovo*** is nevertheless given, as one of the previous studies carried out by NEK Umwelttechnik AG and the Swiss governmental institution REPIC in the past years has shown. However, the selection of appropriate sites is important in order to avoid costly mistakes while developing wind projects. Besides the planned wind park Zatric with an estimated capacity 45 MW, which is subject of this report, NEK is in the meanwhile also in an advanced stadium regarding the development of a second wind park in Kosovo located in the municipality of Suhareka with an estimated capacity of 48 MW. For both of these projects, the application procedure to receive the final permits and licences for construction, grid access and operation is ongoing, and these projects were registered to ERO (Energy Regulatory Office) under the numbers ZRRE/AEU_09/12 and ZRRE/AEU_01/13.

The positive experiences we have made so far during the development of these first two projects have furthermore led us to initiate a ***third wind energy development in Kosovo*** at a site called Cicavica, where we plan to install up to 17 turbines of the 3 MW class.

The Ministry of Economic Development issued earlier this year an Administrative Instruction with the firm aim that by 2020, 150 MW of wind power shall be connected to the grid. NEK is of the opinion that this figure is far too low and that up to 500 MW of wind power can be developed and connected to the grid by 2020, not affecting the stability of the grid in a negative way. A respective EBRD-study is under way and expected to be released by autumn, 2013.

3.3. LEGAL FRAMEWORK

In collaboration with the mission of the United Nations (UNMIK), several policies have been developed and are now in force, which are oriented towards the EC-laws. The energy market is regulated by the independent Energy Regulatory Office (ERO). New feed-in tariffs for wind energy projects are being fixed at € 85/MWh. A Power Purchase Agreement can be obtained for a ten year's period. This period is intended to be extended in the near future to ten plus five years, as stated by the Ministry of Energy and Mining.

The permitting process for a wind park in Kosovo requires different steps and development phases. The following institutions and authorisations are involved in this procedure:

- The municipalities where the project is located
- The owners of the land exposed to the project
- The Ministry of Environment and Spatial Planning
- The Regulator (KOSTT)
- The network owner (KEDS, KOSTT)
- Energy Regulatory Office (ERO)
- Different institutions regarding the implementation of a wind park

the legal basis for energy generation activities in Kosovo is:

- The Law on Energy (LAW No.03/L -184)
- The Law on Electricity (LAW No.03/L -201)
- The Law on the Energy Regulator (LAW No.03/L -185)

While from the environmental side, these rules have to be observed:

- The Law on Environmental Protection (LAW No.03/L -25)
- The Law on Environmental Impact Assessment (LAW No.03/L -24)

And for the construction of the wind park:

- The Law on Construction (LAW No.04/L -110)
- The Law on Spatial Planning (LAW No.2003/14)

The procedure for the permitting process of a wind park project is coordinated by ERO and described in the “Rule on Authorization Procedure for Construction of New Generation Capacities” (issued August 29, 2011). The application procedure is complex but well structured and we refer to aforementioned guideline for further details. The main aim of the application procedure layed down by ERO is to determine if the applicant (and it’s partners) has got the technical and financial capabilities to carry out the project proposed and if the project as such is technically and economically feasible. For wind energy projects, it is therefore mandatory that the applicant is able to render to ERO results from reliable wind measurements as this is the key factor in determing if the planned wind park can be operated on a profitable basis under the fed-in tarrifs laid down by the regulator. Therefore, some wind energy projects were also dismissed at an early stage of the procedure by the Regulator due to the lack of serious wind measurements. Applications that withstand the first due diligence appraisal of

ERO are then laid before the board and if accepted, will be issued a “Notification of Preliminary Authorization” in which the futher requirements and procedures are listed that have to be met in order to obtain the definite authorization. The application for this project was revied by the board of ERO and was granted the “Notification of Preliminary Authorization” on the 1st of March, 2013.

The Law on Environmental Protection obliges project developers of wind parks of a notable size in Kosovo to have an environmental impact assessment carried out for their project by an independent local company spezialised on this sort of assessment. The resulting report has to be approved by the Ministry of Environment and Spatial Planning and an environmental permit will be issued if the project is deemed to be environmentally compatible. Furthermore, the project developer is obliged to hold a public debate in the municipality where the wind park is developed. There, he has to present his project to the public so that any questions can be answered or complaints can be heard and considered. The wind park Zatric was presented to the public on the 29th of October, 2012, and no complaints or reservations from the local population were noted. The report from the environmental impact assessments was approved by the Ministry on the 30th of January, 2013, and the permit issued. Some results from this assessment will be presented in Chapter 8.

Finally, the project developer has to hand in a detailed planning documentation to the authorities in order to obtain the construction license as set forth in the law on construction. For renewable energy production facilities with an installed capacity of over 10 MW, the responsible authority is the Ministry of Environment and Spatial Planning. Projects with a smaller installed capacity are approved by the municipality. The comprehensive documentation for the wind park Zatric has, after a detailed planning phase, been prepared and will be handed in to the authorities in the near future.

Based on our experiences in the past years in Kosovo, the complete application procedure for a wind park until its full permissions requires very sophisticated and professional planning and engineering and a time period of 2 - 4 years.

Table 1: Permits and licenses needed to construct a wind farm in Kosovo.

Permit/Fee	Institution Requiring
Permit for Construction of New Generation Capacities	Energy Regulatory Office
Public Supply License	Energy Regulatory Office
Grid Connection Agreement	KOSTT/KEDS*
Power Purchasing Agreement	KEDS
Environmental Protection Permit (for installation > 5 MW)	Ministry of Environment and Spatial Planning
Construction permit for wind turbines, access road infrastructure, overhead line and transformer station	Ministry of Environment and Spatial Planning (≥ 10 MW) or Municipality (< 10 MW)
Urban permit	Ministry of Environment and Spatial Planning
Consent of landowner (if KFA)	Kosovo Forest Agency

* Depending on grid voltage level. Generally ≤ 35 kV requires grid connection agreement with KEDS and ≥ 110 kV with KOSTT.

3.4. COMMERCIAL LEGISLATION

The former uncertain legal status of Kosovo has created a business climate that has dampened investments in the country. Kosovo has sought to create a commercial climate favourable to international investors. It has intentionally done this as it seeks international businesses to help with their development needs, especially in the energy sector. Businesses are easy to establish with minimal registration costs. An import tariff of 10% on certain goods as well as a standard value-added tax (VAT) of 16% are comparable to other nations in Europe, less than others in the Balkans. However, custom formalities are more complicated than in other European countries and the fact that Kosovo doesn't recognize Carnet A.T.A.* makes engineering activities for foreign companies more difficult. The maximum corporate tax is 10% and rules to prevent double taxation are in place.

The existing legal framework in Kosovo allows incentives for foreign and local investors. The tax code permits carrying forward of losses. The Corporate Income Tax Regulation No. 03/L-113 provides for a special allowance: new assets can be reduced from the tax base (10% of

the cost of the acquisition of the asset). A multilateral Investment Guarantee Agency MIGA (a member of the World Bank Group) states that it guarantees investments in Kosovo in the value of 20 million Euro, while the US Overseas Private Investment Corporation (OPIC) also provides political risk insurance for foreign investors. Kosovo joined the IMF and the World Bank in 2009.

* Carnet A.T.A. is a a standard custom procedure/document that facilitates the temporary import of tools and equipment. For engineering companies, who often use specialized and expensive equipment for their work, it is mandatory that they are able to import this equipment temporarily into the country where they are conducting short-time measurements or surveys without to many administrative hurdles. Currently, 73 countries recognize Carnet A.T.A. Kosovo isn’t one of them.

4. PROJECT LOCATION AND SITE DESCRIPTION

The designated project site for our wind park development is situated in the southwestern part of Kosovo, in hilly terrain at the border of a large basin region called Metohija (Figure 1). Due to the influence of the mountains and hill ranges surrounding the area, the climate and with it the flora and fauna there differs greatly from the eastern part of Kosovo. The Mediterranean climate together with the fertile soil favors the cultivation of vineyards, fruit orchards as well as chestnut and almond trees.

The area for the planned wind park development belongs to the municipality of Rahovec (Orahovac) and lies in hilly terrain near the village of Zatric (Figure 2). The region is characterized by small-scale agricultural and forestry activities and grazing grounds for cattle (Figure 3). The city closest to the project area is Rahovec (Orahovac) - with a population of around 23’000 - in the south of the project site.

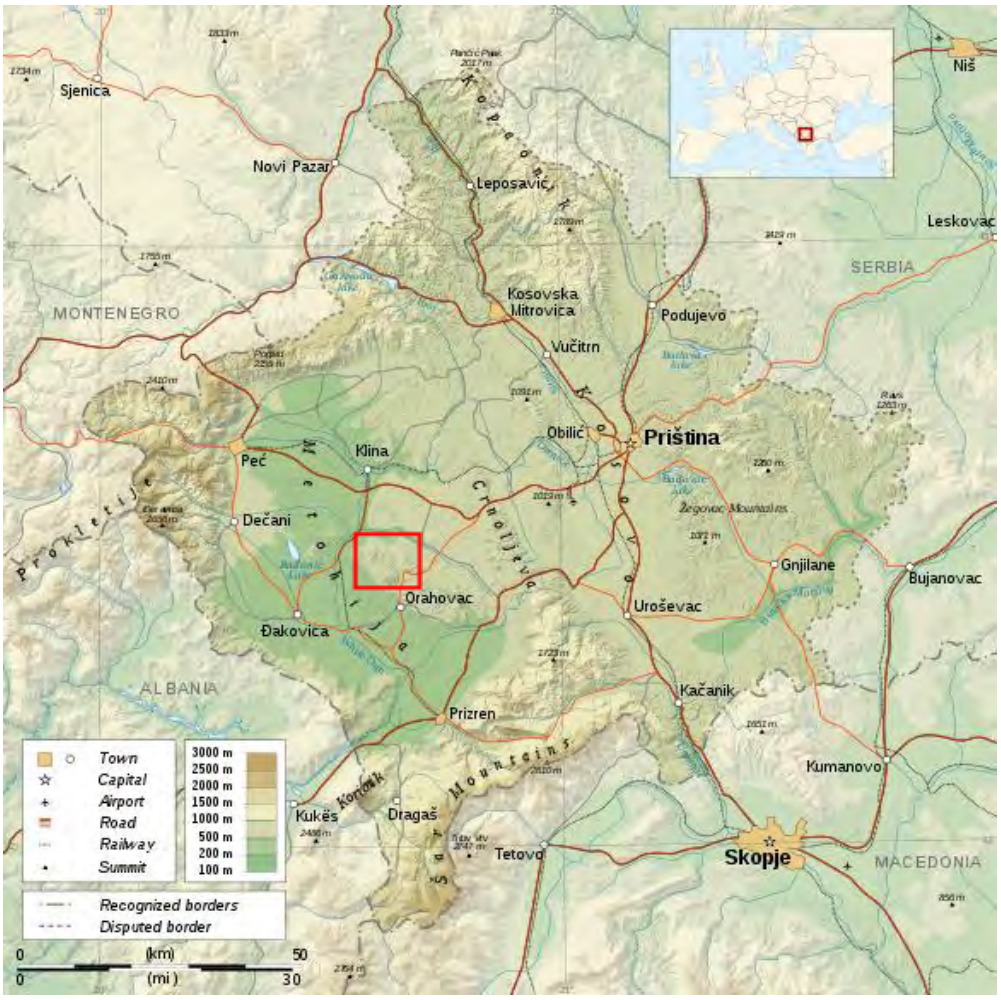


Figure 1: Location of project site in the municipality of Rahovec.

Figure 2: 3D-view of project site using aerial imagery.

Figure 3: Panoramic view from different locations within the project site.

The topography of the project site can be described as complex. It is characterized by a series of parallel ridges that run from North to South. These are part of the same geological formation but may show a different rock type in the top layer. The eastern part of the site has some Karst formations. Karst could cause some problems for the turbine foundations if not identified because adequate building measures have to be taken. However, this aspect was considered while evaluating and determing the individual turbine locations. Most of the affected areas could be avoided whithout having any negative effects on the layout of the wind park. A detailed geotechnical study will be prepared when the foundations of the turbines are designed and the respective loads calculated.

The land-use can be described as follows: Around the village of Zatric and on the slopes facing the village (but not on the ridges themselves), small scale farming is predominant; on the ridges themselves, sparse grassland is predominant because of harsher climate conditions, those are used for extensive cattle grasing; the slopes leading down to the main valley are covered with bushes and small trees and wood is cut by the local people for fuel for their households. Between these ridges and located within a shallow basin lies the small village of Zatric on an altitude of about 880 meters above sea level. The village has a population of around three hundred and has it’s own primary level school and a small shop for the basic daily needs but no industrial buildings or signs of any workshops. Employment can mainly just be found in farming or outside of the village. NEK therefore sees here a big potential for hiring local labour for work that arises during the realisation and operation of the wind park, thereby bringing direct benefits and means of participations to the people living within the project perimeter. The distance between the nearest turbine and the village is at least 500 meters and therefore noise disturbance will be minimal. The land-use is also reflected within the parcel structure (Figure 4). The land on the ridges is mostly owned by the Kosovo Forest Agency (KFA) and is structured into extensive parcels. The area around the village, which is used for small scale farming, is characterized by a complex pattern of small private parcels. The majority of the infrastructure of the wind park will be concentrated on the ridges.

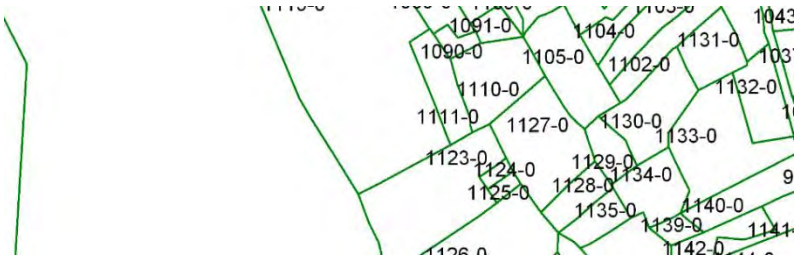


Figure 4: Cross cut of parcel structure from the village (right) up to one of the ridges (left).

5. WIND MEASUREMENTS

5.1. INITIAL MEASUREMENTS ON GSM TOWER

5.1.1. Concept and Equipment

After an initial site selection campaign in autumn 2008, ten different measuring locations in the country were shortlisted. Among them was the site Zatric, named after the nearby village. The general conditions like the availability of GSM towers, good accessibility and presumably favorable wind resource in the hilly terrain were the key reasons for this choice. In July 2009, we started the installation of wind measurement equipment on top of an existing GSM tower at approximately 35 m above ground (Figure 5).

Figure 5: Wind measurement equipment on top of a GSM tower.

The measurement unit was equipped with two anemometers and one wind vane. In addition, the air temperature is measured at ground level. In December 2010, the instruments have been exchanged with ice-free anemometers and a wind vane, as severe icing has led to data losses during the first measurement period. For the later data analysis, only wind data recorded after the sensor exchange was considered due to the higher data recovery rate and quality of the measurements.

5.2. MEASUREMENTS ON METEOROLOGICAL (MET) MAST

5.2.1. Concept and Equipment

The successful wind measuring campaign on the GSM tower in Zatric and the promising project development opportunities there motivated us to plan a new campaign with a state of the art meteorological mast. In May 2012, we installed a 60 m tubular met mast at the project site near the GSM tower location (Figure 6). Synchronic measurements on multiple levels (20/40/60 m) allow us to precisely assess the wind resource on-site and prepare a bankable wind assessment after a sufficient period of data records (minimum one year). The conclusions from the continuous analysis of the measured data was included into the detailed planning of the wind park.

Figure 6: Met mast installation of Zatric 1 (60 m).

In total, the met mast is equipped with four anemometers and two wind vanes. One anemometer is mounted on top of the mast and should therefore be exposed to minimal flow distortion of side booms and the tower. Two of the anemometers, on the top and lowest level, and the uppermost wind vane are heated to ensure optimal data availability in the icy winter months. Additionally, two first class wind speed sensors are installed on the highest side boom and the mid-level.

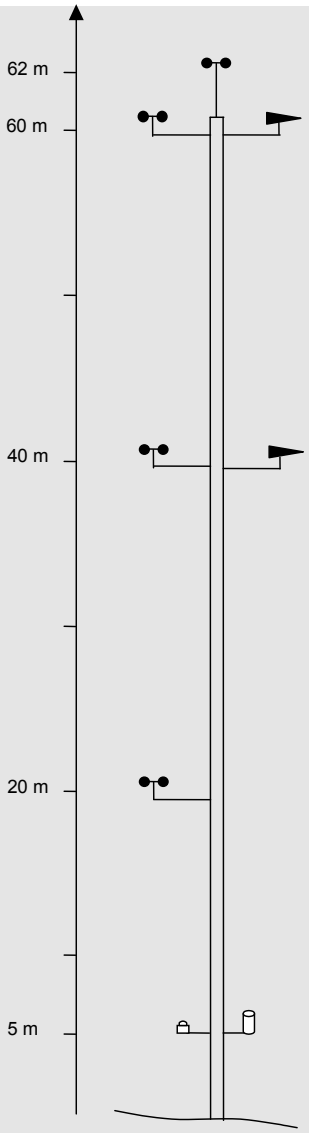
Met Mast (schematic)	Data Log-ger	Meas Height [m]	Sensor	Type	Parameter
	Campbell CR1000	62	Anemometer	Thies First Class	Wind Speed
		60	Anemometer	Vaisala	Wind Speed
		60	Wind Vane	Thies Compact	Wind Direc-tion
		42	Wind Vane	Wilmers Stand-ard	Wind Direc-tion
		41.2	Anemometer	Thies First Class	Wind Speed
		22	Anemometer	Vaisala	Wind Speed
		5	Barometer	P-GE 6/11	Pressure
		4.5	Humidity/-Temperature Sensor	KPC 1/5 ME	Tempera-ture / Rel. Humidity

Table 2: Met mast set-up and instruments of Zatric 1.

Note: *The following data analysis only refers to the measurement data from the met mast as these measurements are more precise and comprehensive than the ones conducted on the GSM-tower.*

5.2.2. Measurement Period

The 60 m tilt-up tubular met mast with wind measuring devices on three (four) different height levels (22/41/60/(62)m) was installed at the project site in mid-May 2012 and is recording data ever since. Details regarding the precise location and period of the measurements are given in Table . We have now collected more than one year of measurements and present an analysis of the results in this report. A bankable wind assessment will be available soon.

Site	Location (Lat/Long WGS84)	Altitude [m]	Measurement Period Start Date – End Date	Period considered for Analysis
Zatric 1	42.45218° N 20.61988° E	1007	14.05.2012 - ongoing	28.05.2012 - 29.05.2013

Table 3: Coordinates and measuring period of met mast Zatric 1.

5.2.3. Wind Data

During the measurement period the wind data was monitored on a regular basis and special events were documented in the met mast protocol. This information together with standard data quality tests is then used for a first data plausibility check.

5.2.4. Quality Control

A preliminary quality check of the gathered wind data is carried out with a set of automated data screening algorithms in order to flag invalid or suspect values for manual review. Special incidents like sensor exchanges, failures or sabotages documented in the met mast history are specially flagged and excluded for further data processing. In a first step, we focused primarily on filtering out icing events. Due to a suspected bearing damage, data from the anemometer on the side boom at 60 m is not further used. A more thorough data quality control and validation will follow for the bankable wind assessment.

5.2.5. Data Analysis

A summary of the data analysis carried out for the one year measurement time series at site Zatric is presented in the subsequent sections.

Data recovery

After a first data cleaning, data availability of the collected wind data is **over 99%.**

Monthly Wind Speed

The monthly wind speed profile for the site Zatric 1 is presented in Figure 7. The monthly wind speed profile reveals some seasonal variation in the wind resource on-site. We observe a peak in spring (March and April) with measured mean wind speed reaching nearly 8 m/s and a low wind phase in September with average speeds below 6 m/s (Table 3). For the average wind speed of May, we only consider the 27 days from 2013 in order not to mix measurements from two different years. A first comparison with longer measurements recorded on the nearby GSM tower showed that average wind speed in December 2012 seems to be below average probably due to some heavy icing.

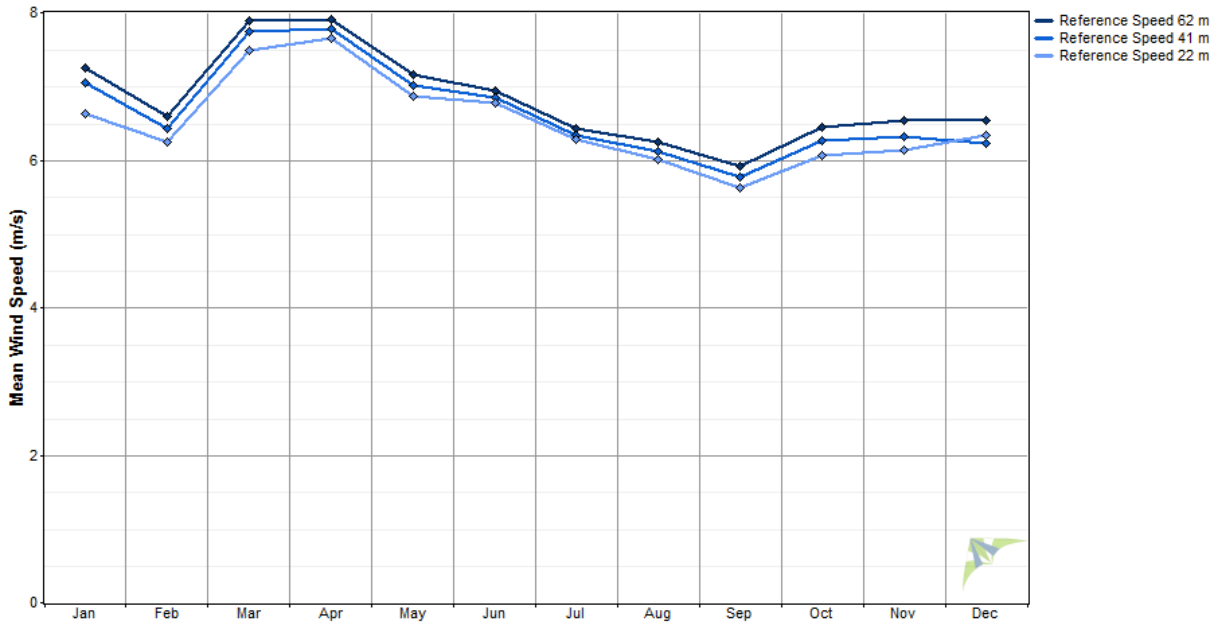


Figure 7: Monthly wind speed profile for the one year reference period at site Zatric.

The daily on site variations in wind speed are significant. We measure low wind speeds in the morning with a minimum at around 10 am and increasing wind speeds in the evening with a peak at 8/9 pm (Figure 8).

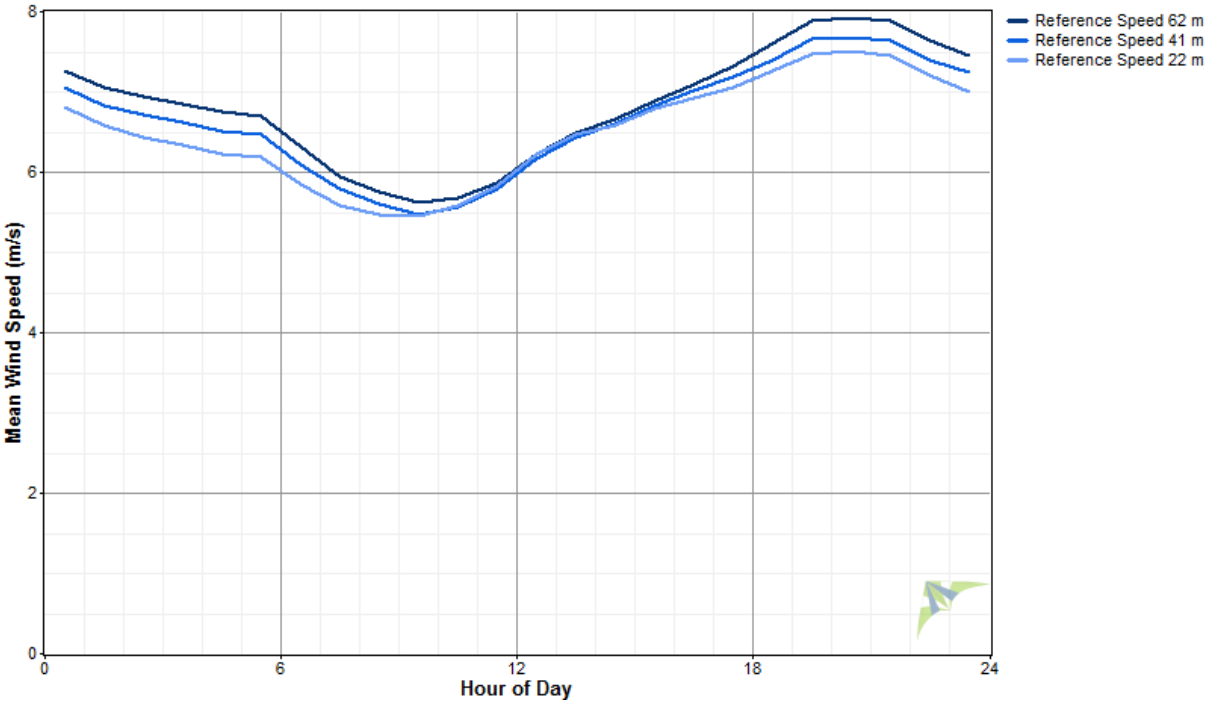


Figure 8: Diurnal wind speed profile for the one year reference period at site Zatric.

Year	Month	Data Recovery Rate @ 62 m [%]	Mean Wind Speed @ 62 m [m/s]	Median @ 62 m [m/s]	Std. Dev @ 62 m [m/s]
2012	Jun	100	6.95	6.83	3.80
	Jul	100	6.44	5.67	3.97
	Aug	99.87	6.25	5.68	3.43
	Sep	100	5.91	4.89	3.84
	Oct	100	6.45	5.62	4.57
	Nov	96.17	6.54	4.83	5.20
	Dec	100	6.54	5.49	4.73
2013	Jan	92.41	7.26	6.51	4.48
	Feb	100	6.58	5.75	4.50
	Mar	100	7.89	7.20	4.99
	Apr	100	7.91	7.89	4.19
	May	100	7.68	7.04	4.74

Table 3: Monthly wind statistics at the top level for the one year reference period.

Overall Wind Speed

The most important annual statistics are compiled in Table 4. The overall mean wind speed for the measurement period is 6.83 m/s at 62 m measurement height.

Mean Wind Speed @ 62 m [m/s]	Median @ 62 m [m/s]	MoMM @ 62 m [m/s]
6.83	6.1	6.83

Table 4: Annual wind speed statistics at the top measurement level (62 m). (MoMM = Mean of monthly means)

Wind Speed Frequency Distribution and Weibull Parameters

The frequency histogram of the wind data binned in classes of 0.5 m/s is presented in Figure . The Weibull distribution seems to fit well to the measured wind speed data distribution. The two factors of the Weibull distribution (shape factor k and the scale factor A) are 7.6 m/s (A) and 1.56 (k). The low k-value is an indicator for a broader frequency distribution and therefore variable and unsteady winds.

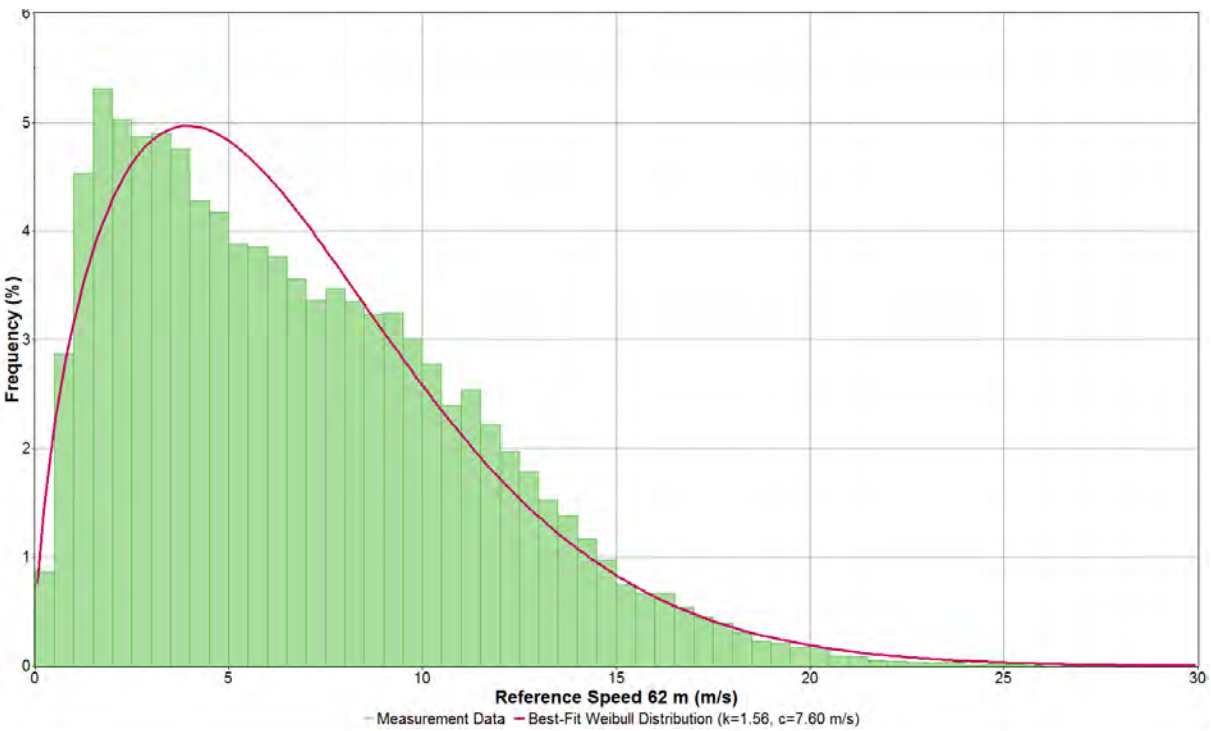


Figure 9: Wind speed frequency distribution and best-fit Weibull curve at 62 m.

Wind Rose

The primary wind direction of the site is southwest and the secondary northeast. The stacked bars are divided into categories of wind speeds (bins of 6 m/s). Most wind speed measurements are in the range from 6 to 12 m/s (Figure). The energy rose reveals that the wind contains most of its energy in the southwestern sector.

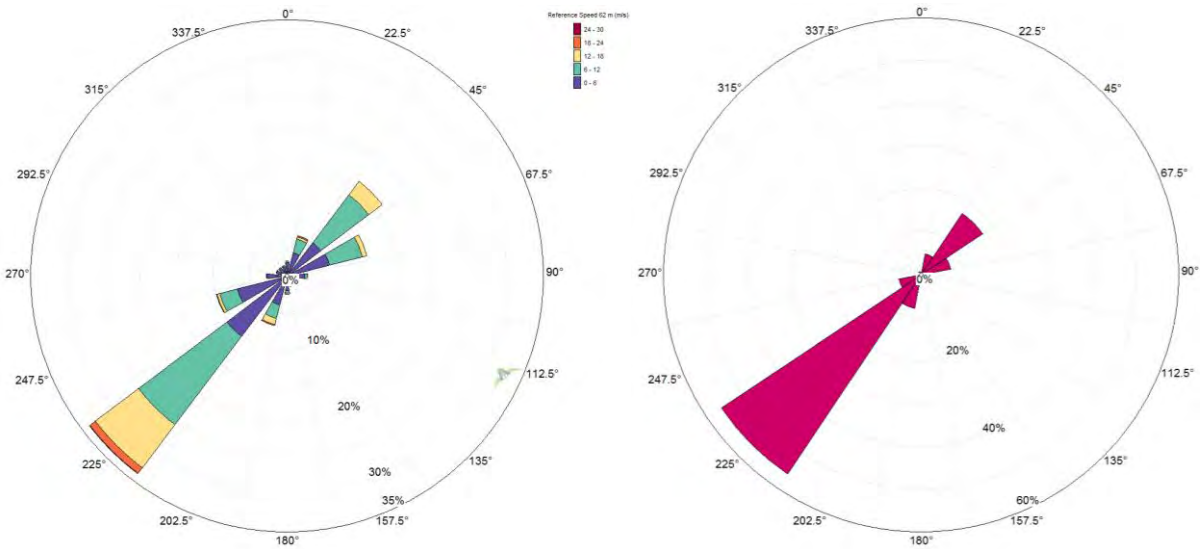


Figure 10: Frequency and energy wind rose at the top level for the one year reference period.

Wind Shear

In this preliminary wind data analysis we determine the shear exponent in each time step using the power law approach. The wind shear is additionally restricted to a predefined range to lower the risk of introducing unrealistic low or high wind speed values. The average vertical wind speed profile is shown in Figure . The mean wind shear for the site is 0.05, a value typical for ridge-top sites due to the terrain-induced speed-up effect in the lower measurement heights. The wind speeds on site therefore change only little with height.

The average wind speed predicted at potential hub heights is listed in Table 5. For 80 m, we estimate **6.93 m/s** and for 100 m hub height **7.02 m/s**. Wind power density values range between 444 and 459 W/m^2.

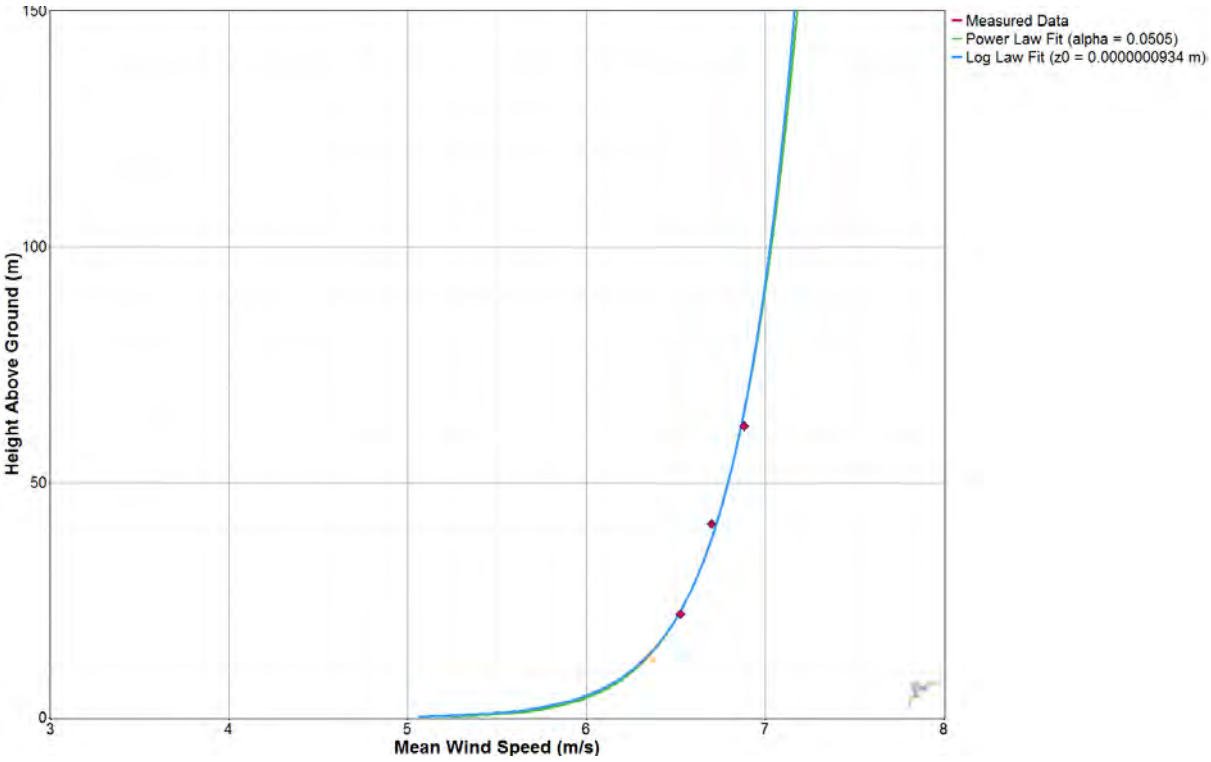


Figure 11: Vertical wind speed profile for the Zatric 1 met mast.

Year	Month	Mean Wind Speed @ 80 m [m/s]	Mean Wind Speed @ 100 m [m/s]	Power Density @ 80 m [W/m^2]	Power Density @ 100 m [W/m^2]
2012	Jun	6.99	7.03	352.09	356.95
	Jul	6.49	6.53	325.88	331.25
	Aug	6.32	6.38	266.06	273.83
	Sep	5.99	6.06	279.00	286.82
	Oct	6.54	6.63	425.58	439.60
	Nov	6.68	6.74	525.34	541.63
	Dec	6.77	6.94	476.35	501.18
2013	Jan	7.48	7.70	537.99	575.73
	Feb	6.66	6.76	440.97	458.78
	Mar	7.98	8.08	669.04	686.31
	Apr	7.97	8.03	520.93	530.36
	May	7.77	7.85	576.66	590.11
Average		**6.93**	**7.02**	**444.39**	**459.02**

Table 5: Monthly extrapolated wind speeds and power densities at 80 and 100 m hub height.

Turbulence Intensity

The measured mean turbulence intensity for the measurement location is 0.15 (15%). The representative turbulence intensity at 15 m/s is 0.07 (7%) which classifies as a turbulence category C site according to IEC standards (Figure 12).

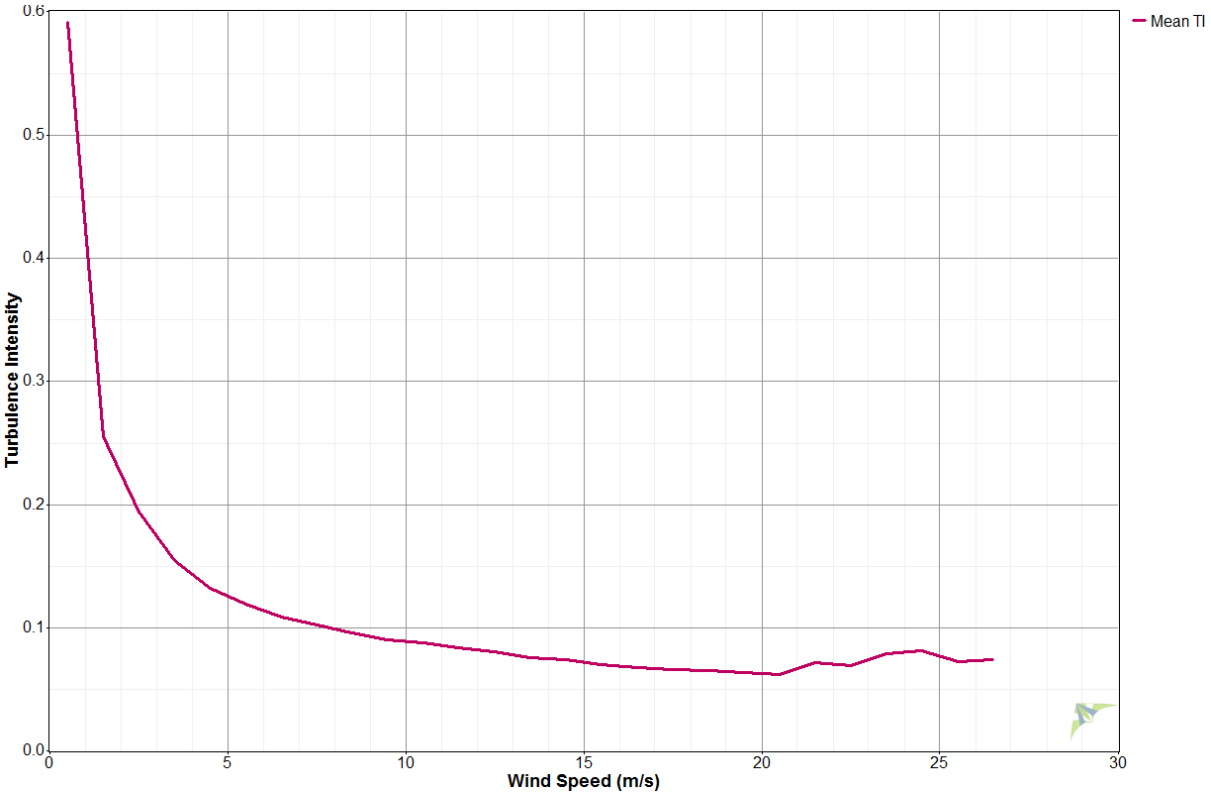


Figure 12: Turbulence intensity binned by wind speed at top level (62 m).

Temperature and Air Density

The average air density is deduced from temperature and pressure measurements near ground level. With this two input measures, we estimate an average air density of 1.1 kg/m^3. The annual temperature curve is shown in Figure 13.

Figure 13: Temperature evolution at the measurement location (@5 m above ground).

5.3. WIND FLOW MODELLING

For this first wind assessment, we test two linear wind models implemented in WindPRO (WAsP) and openWind for modeling the spatial distribution of the wind resource across the project site. As additional input we use a photogrammetrically generated digital height model of the project site with a horizontal and vertical accuracy of 20 m and a land cover map for the roughness model based on high-resolution aerial imagery. The calculated wind resource map at 100 m hub height has a spatial resolution of 50 m according on the digital height model used (Figure 14). At a later stage, the modeling will be refined using a more suitable model for the terrain type of the project site like computational fluid dynamics models or a coupled mesoscale- and microscale approach.

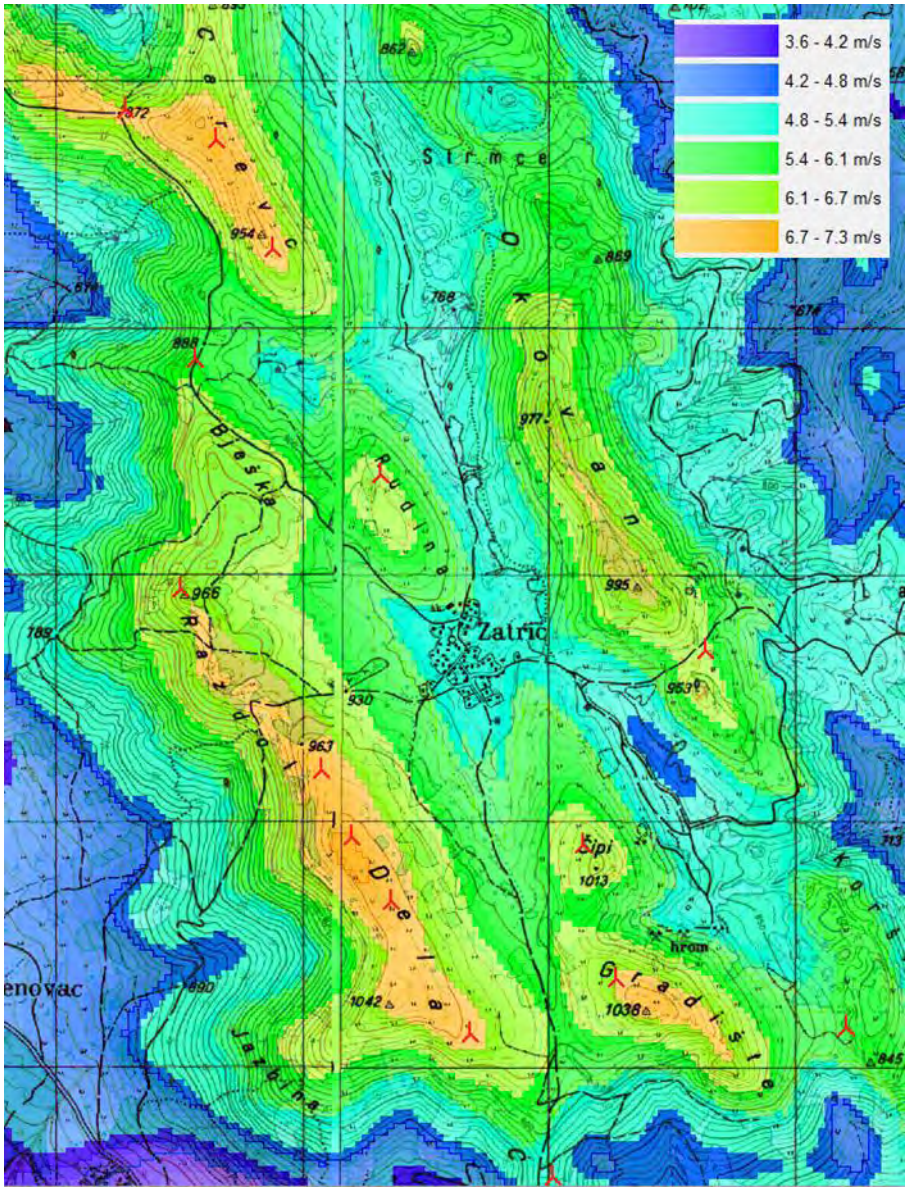


Figure 14: Preliminary wind resource grid with 25 m resolution for the project area.

5.4. PRELIMINARY ENERGY PRODUCTION ESTIMATION

The preliminary results of the power production, i.e. net annual energy production (AEP), net equivalent hours (NEH) and capacity factors predicted for the wind park Zatric with 15 Siemens SWT-113 turbines are listed in Table 6. We applied a standard reduction of 10% on the net AEP. The capacity factors determined with the different wind models ranges from 29.1 and 31.3% which results in NEH’s of between 2’551 to 2’747 h. A preliminary prediction for the final annual power production of 15 turbines is between 114’793 and 123’646 MWh/yr depending on the wind model used.

Turbine Model	Wind Model	Mean Wind Speed @ Hub Height [m/s] (all turbines)	Net AEP (MWh/yr) – 10 %	Net Capacity Factor [%]	NEH [h]
Siemens SWT-3.0-113 (99.5 m)	WAsP	6.5	114'793	29.1	2'551
	openWind	6.8	123'646	31.3	2'747

Table 6: Preliminary production estimates for the wind park Zatric.

5.5. CONCLUSION

The measurements are still ongoing and more data is collected every day. The results from the reference period 28th of May 2012 until 27th of May 2013 show that the wind resource at the site is good with a measured average wind speed of 6.8 m/s at the top measurement height (62 m) and a predicted mean wind speed of **7.02 m/s** at **100 m**. The wind shear is very low (0.05), therefore the rate of change in wind speed beyond measurement heights is small. Reason for this might be the ridge-top location of the met mast and the coupled terrain-induced flow acceleration to be expected in the lower measurement levels of the mast. We predict a mean wind speed of approx. 7 m/s at 100 m above ground (potential turbine hub height). For the purpose of this first wind analysis, the wind modeling is conducted with two different linear models and will be refined later on with more sophisticated modeling techniques for complex terrain. The energy output calculations for our turbine of choice for the site - the SWT 113 3.0 MW - range between 2'551 and 2'747 full load hours and an overall energy yield of between 114'793 and 123'646 MWh/yr for all 15 turbines depending on the wind model used. Note that no climate adjustment with long-term reference data was carried out for our measurement data, therefore the energy calculations based on this data set does not represent the expected long-term mean. This issue will be further addressed in the bankable wind assessment that is currently prepared where we will also include a detailed uncertainty analysis.

6. WIND PARK LAYOUT

6.1. EVALUATION OF POSSIBLE TURBINE LOCATIONS

Following basic rules were obeserved while determing the layout of the wind park:

- Place the turbines in those locations where the wind potential is the highest and interference through topographical features is minimal.
- Consider the minimum separation distances between the individual turbines in order to avoid negative disturbances due to turbulence and wake effects.
- Choose locations where enough open space for construction purposes is available and which can be accessed by existing or new roads.
- Respect a minimum distance to settlements in order to avoid any negative disturbances through noise and shadow flicker.
- Determine the optimal number of turbines to profit from scale effects with the infrastructure (i.e. costs for substation, OHL, main access road).

After the met mast was installed, a thorough site investigation was carried out during several visits in May and June, 2012 (Figure 15). The preliminary layout, that we worked with before, was critically analyzed and some alternative locations evaluated. To each potential location, a catalogue of pre-defined and weighted criteria was applied and assessed. On this site investigations, we were accompanied by local villagers, who were able to give us useful inputs to the local conditions and access options. As is described in the next chapter, some adaptions to the preliminary layout were necessary due to certain topographical constraints.

Figure 15: Site investigations for determing and validating the wind park layout.

6.2. LAYOUT

The wind farm layout consists of 15 turbines with a power capacity of 3 MW with a hub height of 100 m. The total capacity of the wind park is expected to be 45 MW, but depends on the finally selected turbine model. There are several turbine types that are currently evaluated for the project but the final decision will be made in the near future. Until then, we use the Siemens SWT-3.0-113 turbine model with 99.5 m hub height and a rotor diameter of 113 m as reference for calculation purposes.

In Figure 16, the project area (marked in yellow), the individual turbine locations and the measuring points are shown. The total project area extends approximately 5.5 km in the north-south direction and 2.5 km in the east-west. The turbine micro-siting process was as mentioned in the introductory influenced by different factors which restrain the placement of turbines like wind resource, terrain constraints, distance criteria (to villages and single inhabited buildings), road accessibility and land availability. Another important parameter is the spatial distance between turbines since turbine wake effects may substantially affect the turbine efficiency. In practice, a minimum physical separation of three rotor diameters is recommended. In the prevailing wind directions (NE and SW), larger turbine spacing of approximately seven rotor diameter is necessary. A distance rose which is generated according to the sectorial distribution of the wind rose is a useful instrument to monitor that the separation distances between the turbines are kept at all times and that the layout is still valid after changes.

After a thorough site inspection of each of the provisional turbine positions, the wind park layout was updated according to the latest findings. Seven out of the total 15 turbines had to be moved due to limited accessibility and space availability at the original sites. In some cas-

es, the displacements lead to turbine performance losses because of the changed wind resource at the new location.

Figures 17 - 19 present some preliminary visualizations of the wind park Zatric during summer and winter time and from different perspectives.

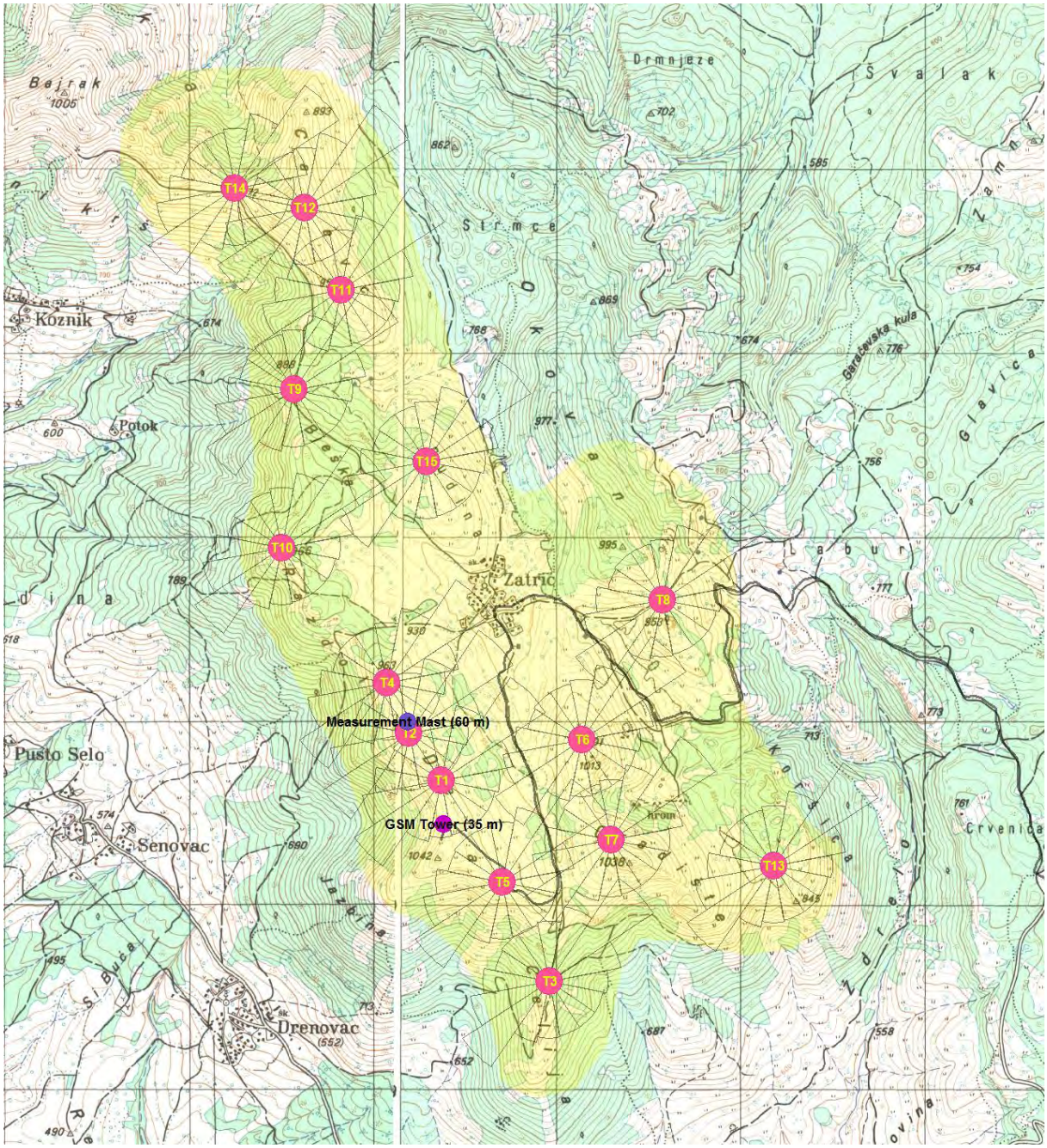


Figure 16: Draft layout of potential wind park in Zatric with wind rose deduced separation distances between the turbines.

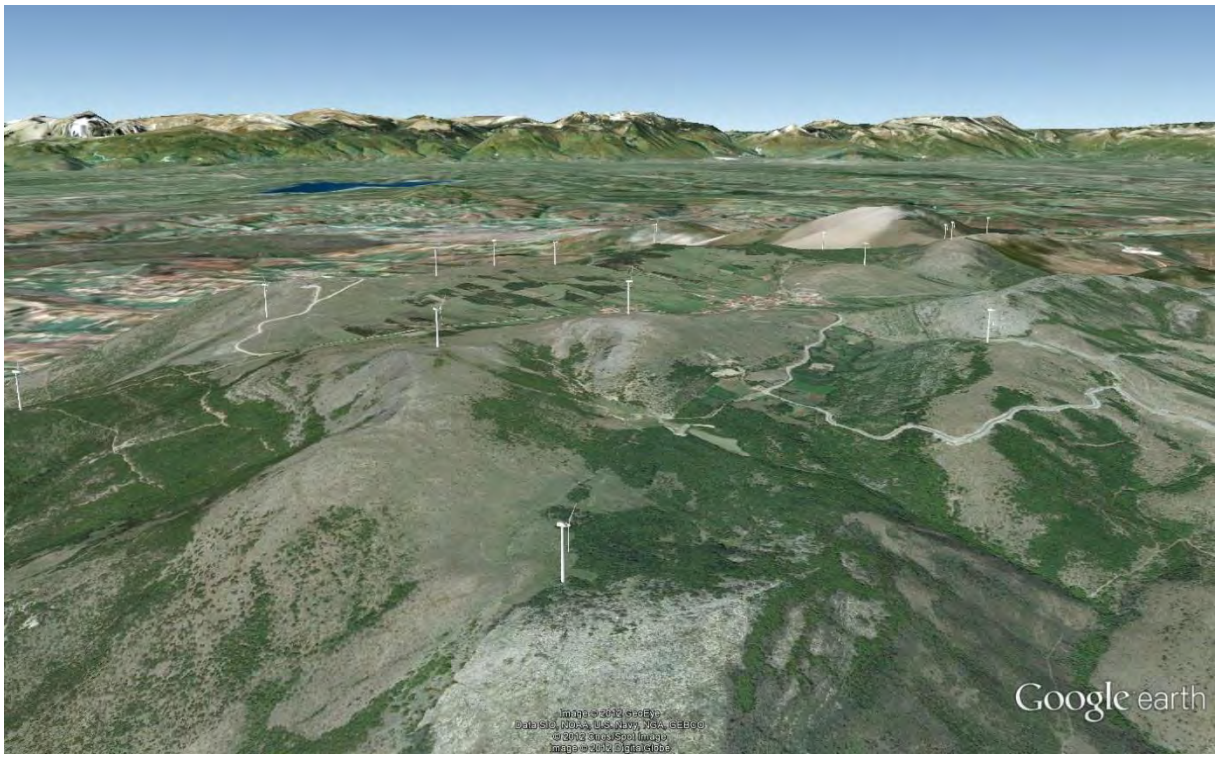


Figure 17: Visualization of wind park Zatric (viewed from East).

Figure 18: Visualization of wind park Zatric (zoomed from Southwest).

Figure 19: Visualization of wind park Zatric during winter (viewed from South).

7. TECHNICAL PROJECT CLARIFICATIONS

7.1. BASIC INFRASTRUCTURE REQUIRED

With professional wind measurements set up and the turbine layout defined, the next step in the wind park development was to concretize the technical aspects of the project. The basic infrastructure necessary for the installation and operation of the wind turbine consists of:

- Internal access roads for transportation of the various turbine components as well as the cranes and building machines for the installation phase. These roads also are needed during the operation phase of the wind park in case any maintenance work on the turbines is necessary.

- Internal electrical grid bundling the electricity produced by the turbines and connecting them to the parkinternal substation or collector node.

- Parkinternal substation for transforming the electricity produced to a higher voltage level, so that it can be evacuated to the designated feed-in point into the national grid without high electrical losses (only necessary for long transportation distances - otherwise collector node).

- Overhead line (OHL) connecting the parkinternal substation or collector node to the next feed-in point.

- Temporary cleared and leveled areas for installation purposes.

- Permanent hardstands next to the turbines for maintenance purposes.

Therefore, a central task of each feasibility study is to determine if the necessary infrastructure can be constructed in adequate form and with justifiable costs.

7.2. TOPOGRAPHICAL SURVEY

In February and April 2013, a basic topographical survey of the project site was carried out with plans of a more comprehensive survey to follow at a later stage. The aim of this survey

was to obtain planimetric data for the turbine foundations, the permament maintenance hard-stands and the temporary hardstands required for construction purposes. Furthermore, track profiles of suitable access routes were taken for further analysis and for the planning of the parkinternal access road network. The survey was conducted with a high precision GPS device, which measurements are corrected and obtain higher precision by the use of a mobile GPS base station that is placed within the project perimeter. This survey was carried out by staff of NEK Romania Srl. together with local helpers from the village of Zatric. As only a limited number of points can be measured within a certain time step, the GPS method has its limits when conducting an area-wide topographical survey. Therefore, it is the intention of NEK to carry out a further survey with a Riegl-Scanner or with photogrammetric methods (or with both methods combined). Anyway, the results from this first survey helped us to make considerable progress on the design of the wind park. Figure 20 shows one of the plans that was drawn on the basis of a locally available DTM (Digital Terrain Model) and was validated with the measurements from the survey.

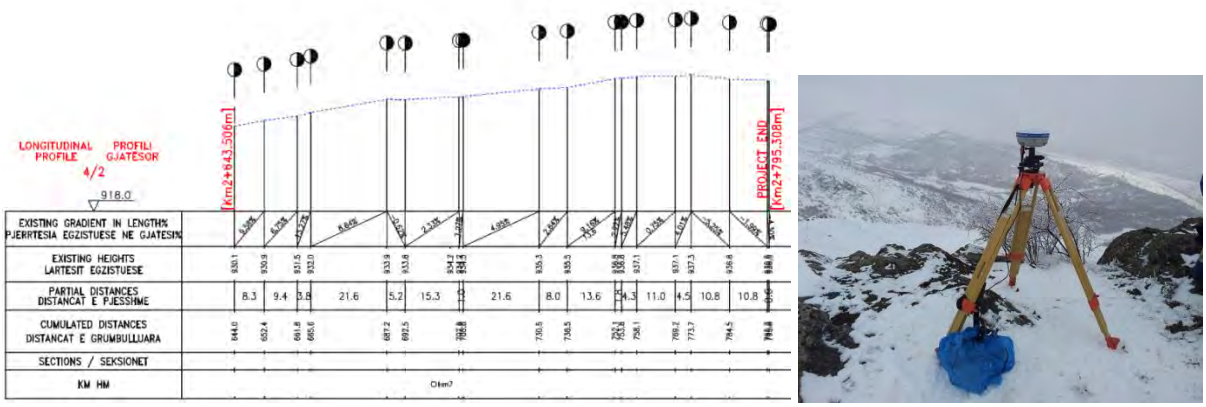


Figure 20: Longitudinal profile of an internal access road section (left) and GPS base station.

7.3. TRANSPORT ROUTE EVALUATION AND ACCESS ROAD DESIGN

7.3.1. Transport route evaluation

As most modern wind turbines can’t be broken down into small individual compoments for transportation, logistics poses a challenge. For instance, a rotor blade has to be transported as one complete part. For a wind turbine like the Siemens SWT-3.0-113, a single blade may measure 55 metres and weigh around 14 tons and while other components like the nacelle may have smaller dimension they can weigh up to 70 tons. The implications for logistics is quite clear: transport by seaway as close as possible to the project site (however, the har-

bour needs suitable unloading facilities) and then switch to a well maintained road with adequate curve radius, passing heights and weight limits. For Kosovo, two suitable points of access can be identified: one is from Belgrad, Serbia, following the main highway and the other is from Durres, Albania, following the new highway connecting Tirana with the city of Prizren in the south of Kosovo. Due to the uncertain custom situation between Serbia and Kosovo we concentrated on the alternative route from Durres and assigned the German - Romanian company Holleman Srl. to conduct a road study for this route. This was carried out in April 2013 and was combined with the evaluation of parkinternal access road solution. As one major constraint, a tunnel on the highway between Tirana and Prizren was identified, whose maximum height limit wouldn’t allow the turbine blades to pass without them being previously turned by 90° around their longitudinal axis by a mobile cran. This would add extra costs to logistics. As recently a custom agreement was found between Serbia and Kosovo, we will as a further step also evaluate the transport route Belgrade - Pristina.

Figure 21: Some impressions from the road study.

7.3.2. Existing access roads and tracks

The project site near the village of Zatric is connected well to the national road network. Coming from the capital Pristina, it can be reached via a two-lane, well developed road, passing by the city of Malisheve in the direction to Rahovec. Coming from Prizren, it can reached by an equally well developed road passing through Xërxë and then the outskirts of Rahovec. From Rahovec, once again the connection to Malisheve can be used but this time from the other direction. For the last part of the way, we leave the main road and turn into a newly paved road section for the next 5 km (marked blue). The road has a width of about 5 m. Partially, steep sections and narrow turns would most likely require structural adjustments to the road so as to be suited for turbine transportation.

From Zatric, a hard gravel road (in yellow) leads to our measurement location, which was originally built to access the GSM site on the hilltop nearby. Although in good condition, this

gravel road can’t be upgraded so that it is suitable for the transportation of the turbine components. The reason being that the turnoff to this road is in the middle of the village of Zatric and the components can’t be transported through the village without a number of houses having to make place for this. As it is the aim of NEK, that the project won’t have any unnecessary negative impacts on the village, an access road network was designed that bypasses the entire village.

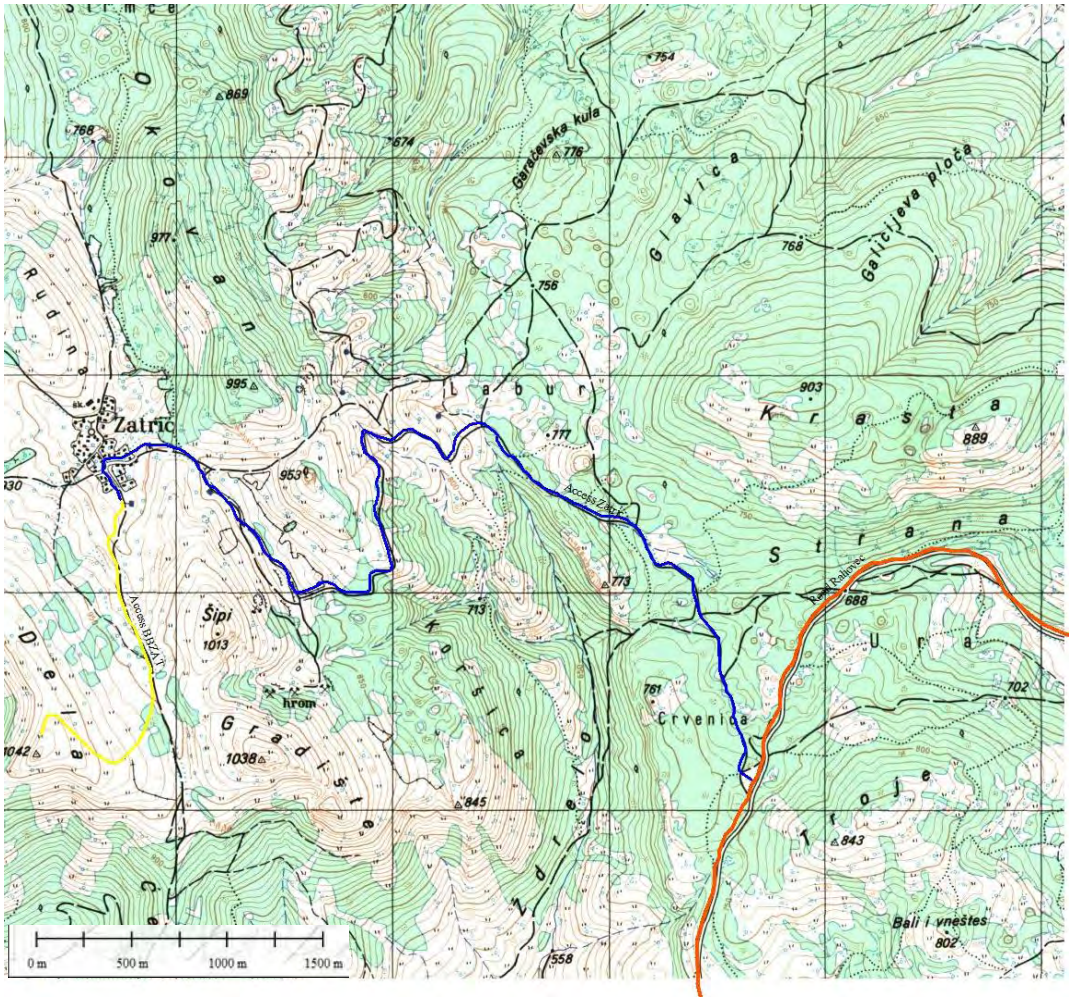


Figure 22: Access roads to project site.

Within the project perimeter, a network of tracks already exists, which is used by local farmers to access their fields. With only a width of approx. 2.5 meters, these tracks would need considerable upgrading to make them suitable for turbine transportation. However, these tracks in general follow the most suitable routes in respect to the topography and therefore form a suitable basis for further development where the road gradients aren’t to high. The 500 m long track connecting the GSM area with our met mast can be shown as an example for the already existing network of tracks.

Figure 23: Gravel road access to GSM site (left) and dirt track leading to met mast location.

7.3.3. Requirements for access roads

Due to the dimension and weight of the cargo, access roads have to be at least 4 m wide in straight sections and have to have an adequate foundation layer of crushed stones and gravel. The road has to have suitable drainage, which can be achieved through a very slight lateral angle. For road bends, a certain area to the left and the right of the road has to cleared from obstacles depending on the angle of the curve. Most turbine manufactures and transport companies accept a maximum gradient of 10% for the access roads. On short stretches a gradient of 15% may be tolerated but is not advised. To facilitate the transportation process, at least one or two passing areas for the trucks are recommended within the project perimeter.

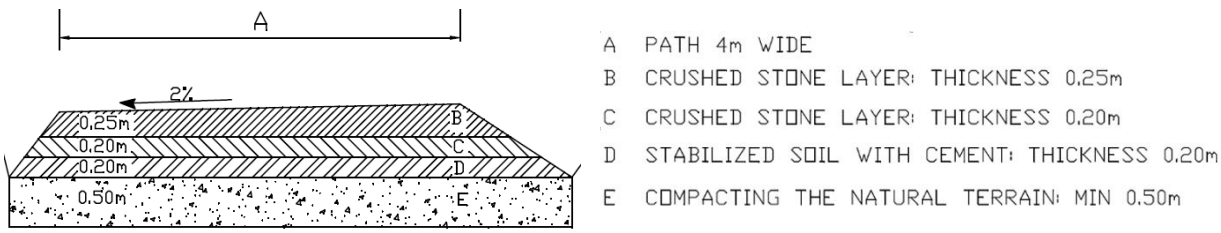


Figure 24: Cross section of an access road.

7.3.4. Access road design

A major constraint for the access road design in Zatric is the complex terrain and the geology of the site. The shortest way possible (under consideration of the maximum allowable gradient) may not be the most economic if rock formations have to be passed or river beds crossed. The basic task was therefore to balance length of road against complexity of terrain and find a solution that can be build at reasonable costs. Therefore, a thorough investigation of all access possibilities and an evalutation of the existing track network was carried out during our topographical surveys in February and April, 2013, and the results discussed with Holleman Srl.. The result is a road network where all turbines, with exception of turbines 3, 8 and 13, are connected by one single access road and a series of short dead end roads. The main access road forks of from the existing asphalt road before the entrance to the village and then starts a gradual climb up to turbine 5 while providing access to turbine 6 and 7 on its way. From there, it bypasses the GSM area and leads all the way northwards up to turbine 14 following mostly existing tracks. Thereby, some sections have been identified where the road must be fortified due to the high lateral gradient (i.e. the steep slope leading down to the main valley between turbines 9 and 14). Turbine 13 will be accessed by a separate road, which will be extended up to turbine 3 following the contour lines. A short dead end road will provide access to turbine 8.

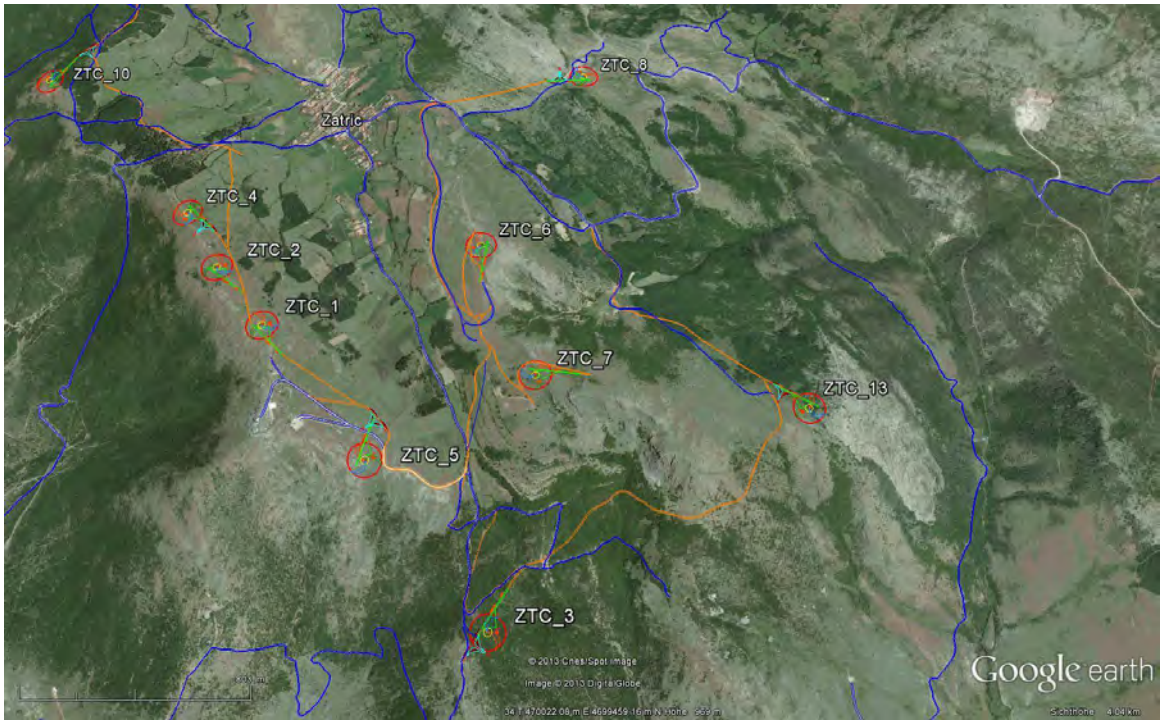


Figure 24: Planned access road network (orange) and existing tracks / roads (blue) in the southern part of the project perimeter.

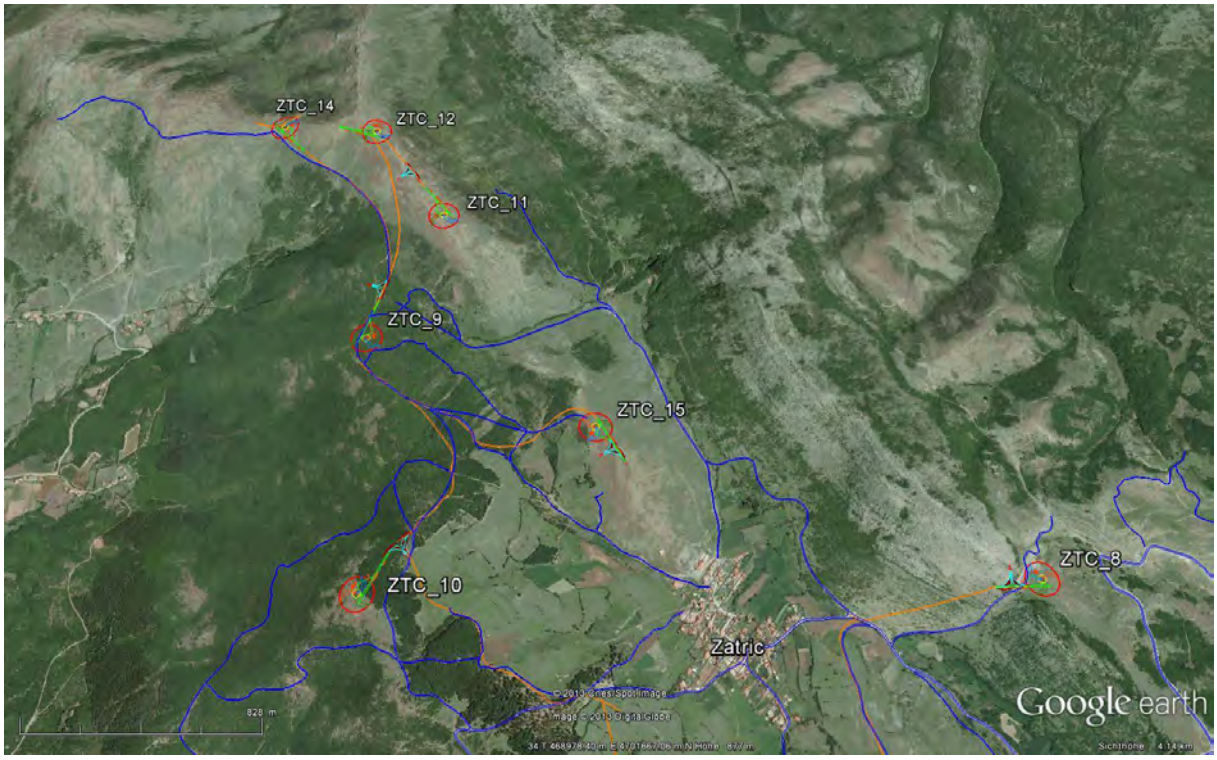


Figure 25: Planned access road network (orange) and existing tracks / roads (blue) in the northern part of the project perimeter.

The next step will be to prepare the necessary engineering documentation so that a building contractor will be able to assess the scope of the work, determine the machinery needed and realise the road network. A extended survey together with an experienced road engineering company is mandatory and will be one of the next steps in the project development.

7.3.5. Platform and foundation requirements

Of course the site requirements for the construction phase and later for maintenance may vary between individual turbine types and manufacturers. In general, for a turbine with a capacity of 2 - 3 MW and a hub height between 80 and 100 m, a concrete foundation with a diameter of 15 to 20 m and a depth of 3 to 5 m is required. The permanent maintenance platform should have a dimension of around 40 x 20 m. Specifications to foundation dimensions are only reluctantly provided by turbine manufacturers. The same is true for the dimensions of the permanent maintenance platform and the temporary hardstands required for the installation of the turbines. This makes a comparison of the individual turbine types very difficult. Especially for topographical complex project regions these site requirements are an important factor (next to the efficiency of the turbine and the calculated energy yield of course)

for deciding which model to choose. Therefore, we have chosen a turbine model with very strict site requirements with above average dimensions for our design. The reason for this being that if in the end a different model is chosen, the dimensions of the sites are still generous enough to accomodate the new choice.

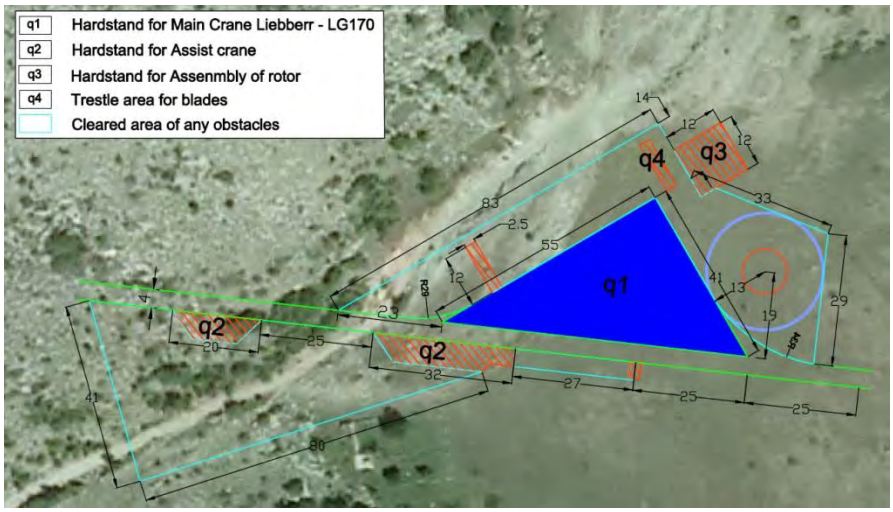


Figure 26: Site requirements for the installation of a 3-MW turbine. Apart from the circular turbine foundation (light blue) and the maintenance platform (dark blue) all structures are only temporarily needed for the installation of the turbine.

The data from our surveys and site investigations show that a considerable amount of excavation and filling will be required at some of the turbine locations for obtaining a cleared space large and level enough for the requirements of the turbine manufacturers. This affects especially the turbines in the northern part of the project perimeter. Other turbine locations like the ones on the western ridge require considerably less earthmovements. After the installation of the turbines only the permanent hardstand and the access roads will be maintained and the rest of the cleared area can be reclaimed by the vegetation.

7.4. GRID ACCESS

7.4.1. Parkinternal grid and substation

The electricity produced by the wind turbines is already transformed within the turbine to a medium voltage level between 20 and 35 kV to reduce the parkinternal losses. Depending on the voltage level at the feed-in point and the distance to the next transformer station of the national resp. local electrical grid, the electricity produced by all the turbines is either bundled

at a connection node or transformed to a higher voltage level before being evacuated over an overhead line to the next feed-in point. Which option is more suitable depends on a simple trade-off between lower voltage, lower infrastructure costs but more electrical losses along the overhead line or higher voltage, lower electrical losses along the overhead line but higher infrastructure costs. To evaluate the economically most viable solution NEK assigned the Swiss electrical engineering company Pelco Srl., who already gained local experience while designing and planning some infrastructure of the national distribution grid in Kosovo, to carry out a corresponding study. Thereby, four possible alternatives were investigated:

- **Option A:** Installed capacity 30 MW, electrical output wind turbine 35 kV, connection node (collector point), 35 kV overhead line to feed-in point in Rahovec, feed-in voltage 35 kV.
- **Option B:** Installed capacity 45 MW, electrical output wind turbine 35 kV, connection node (collector point), 35 kV overhead line to feed-in point in Rahovec, feed-in voltage 35 kV.
- **Option C:** Installed capacity 30 MW, electrical output wind turbine 20 kV, parkinternal substation (20 kV to 110 kV), 110 kV overhead line to feed-in point in Rahovec, feed-in voltage 110 kV.
- **Option D:** Installed capacity 45 MW, electrical output wind turbine 20 kV, parkinternal substation (20 kV to 110 kV), 110 kV overhead line to feed-in point in Rahovec, feed-in voltage 110 kV.

Regardless of which option will be chosen, all turbines will be connected to the collector point respectively the parkinternal substation by two loops dividing the wind park into a western and eastern section. The cables will follow the access roads because then the cable trenches can be dug and the cables laid while the roads are being constructed using some of the same machinery. The Pelco study showed that it is more effective to use a 35 kV overhead line solution with parkinternal collector point, because the additional costs for a parkinternal substation and the electrical losses caused by the transformation from 20 kV to 110 kV outweigh the advantage of the smaller electrical losses of a 110 kV overhead line considerably. The study also showed that it doesn’t have any great effect on the infrastructure costs if an installed capacity of 45 MW is chosen instead of 30 MW and that the relative electrical losses are somewhat reduced with a higher installed capacity.

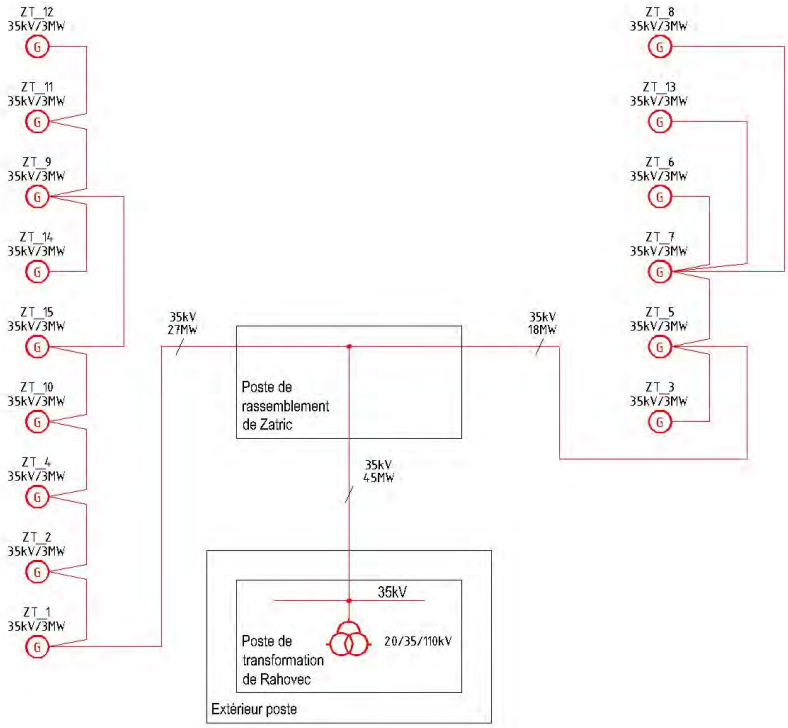


Figure 27: Option A for connection of the wind park to the national grid.

7.4.2. Substation Rahovec and national grid

The next feed-in point into the national grid for the wind park Zatric is the substation (110/35/10 kV) in Rahovec. The distance between the wind park and this substation is about 8 - 9 km. The planned overhead line connecting the wind park to the substation will mostly follow an already existing road. The only challenge will be the first section of the overhead line, where a height difference of about 500 meters has to be overcome within a short distance. Different possibilities for this were investigated and discussed between our engineers and personell from KOSTT on site visits this summer.

According to the national grid operator KOSTT, the grid at the substation Rahovec is stable enough to take on the electricity produced by the wind park. The substation Rahovec is connected to the national grid by a 110 kV dead end line coming from Prizren and is eventually fed by the lignite power plants Kosovo A and B near Pristina. Construction work for a 400 kV transmission line between Kosovo and Albania started in May 2011 with the aim of enhanc-

ing the power supply security for both countries. This line will pass very near to Rahovec. However, there are no plans to connect the substation Rahovec directly to this line.

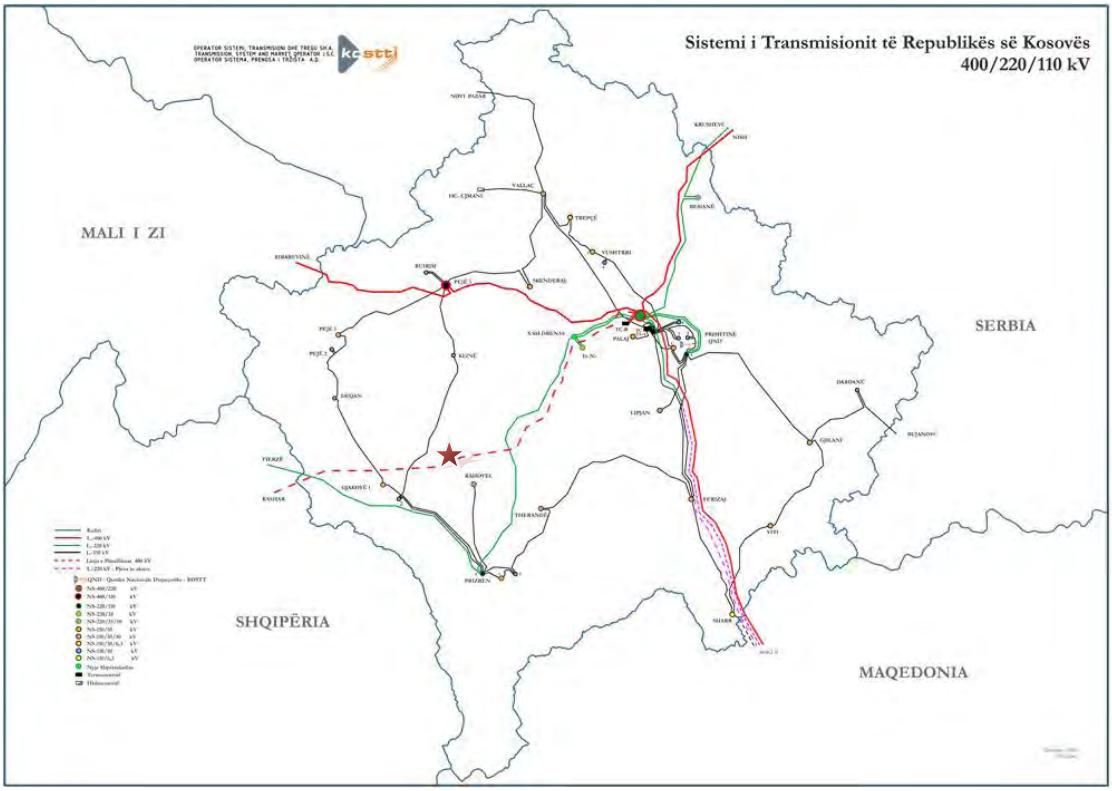


Figure 28: Transmission grid of Kosovo (star marks project site). Source: www.kostt.com.

8. ENVIRONMENTAL ASPECTS

This section touches the subject of expected environmental impacts of the Zatric wind park and gives a short overview of the situation with the final wind park layout. Two important effects, namely turbine noise and shadow flicker, are covered which may negatively influence nearby villages and inhabited single buildings located close to the turbines. A detailed analysis is delivered in the Environmental Impact Assessment (EIA). The EIA documentation was handed in to the relevant authorities in August 2012 and the respective public debate and hearing took place in October 2012 in Rahovec. The response of the local population was mostly positive and no complaints or concerns were registered during the hearing. The final environmental permit was issued by the Ministry of Environment and Spatial Planning (MESP) on the 30th of January 2013 after the project was reviewed during a meeting of the responsible board.

The EIA showed that no significant negative impacts on the environment are expected by the construction and operation of the wind park. This can be explainded by the fact that:

- no rare species (flora and fauna) can be found within the project perimeter.
- the vegetation at the planned turbine locations is very sparse and temporarily cleared areas for construction purpose can be reclaimed by the natural vegetation after the turbines have been installed.
- no known major bird migration routes lead through the project perimeter.
- necessary measures and technologies will be implemented to reduce any negative impacts on the environment (specifics mentioned in the EIA documentation).
- a minimum distance of 500 meters is kept between the nearest turbines and the village of Zatric.

In addition to the EIA documentation that was prepared by a local environmental engineering company in Kosovo, NEK carried out there own investigations and calculations as is shown in the next two chapters.

8.1. NOISE

Wind turbines produce noise from different mechanical and aerodynamic sources. In order to assess noise propagation across the project site and identify potential conflict zones, a special model, implemented in openWind, is used to generate a noise map.

In Figure 28, we analyzed the noise exposure for residential areas within or close to the wind park. Every single house in Zatric, inhabited and uninhabited, was digitized according to up to date aerial imagery. In some cases, houses that are for example built together were grouped as one object. Obstacles that shield the residences like vegetation or high walls could not be considered in the model. Only few houses at the periphery of the village Zatric are slightly affected of the turbine emitted noise. Noise mapping revealed that the houses have noise levels between 35 and 40 dB. This is well beneath the widely accepted noise tolerance level of 45 dB during daytime. Even at night, when noise is most disturbing due to the reduced background sounds, the predicted noise values for all the houses do not exceed 40 dB. It can therefore be concluded that the noise exposure caused by the wind park is harmless. The calculations will be repeated as soon as the turbine model is definite and we can apply detailed turbine noise information.

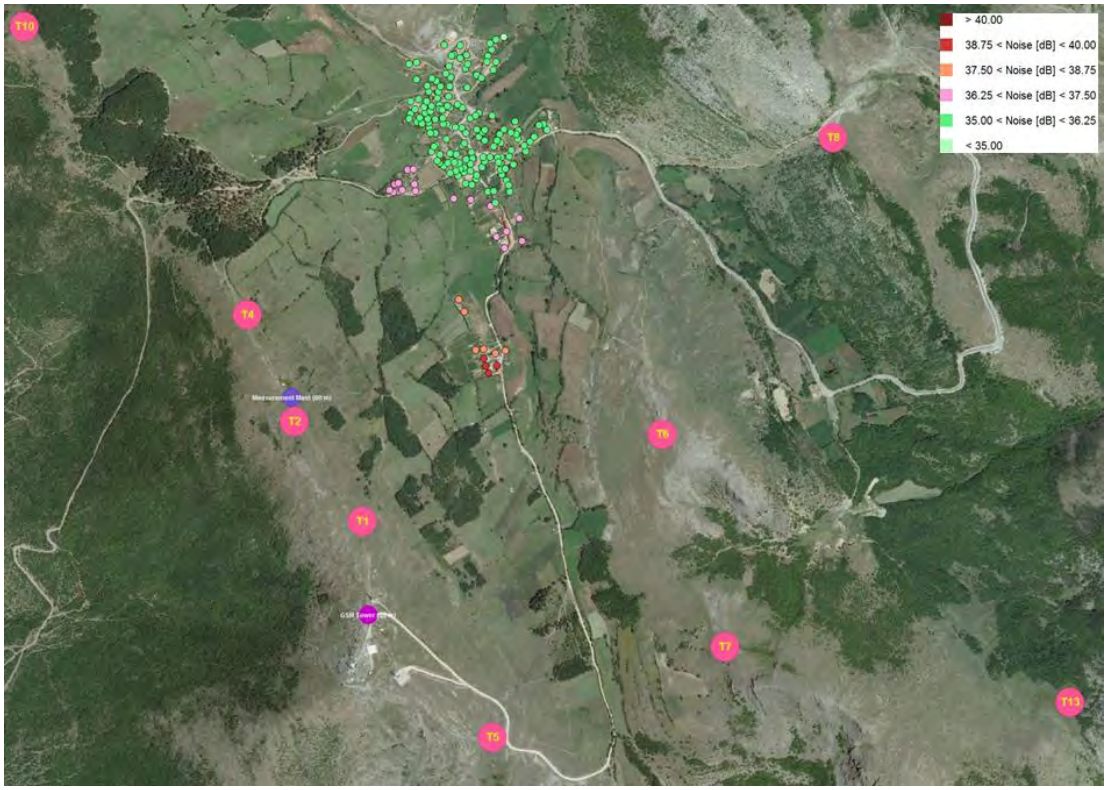


Figure 28: Noise exposure for all the houses in the village of Zatric.

8.2. SHADOW FLICKER

Apart from noise emissions, shadow flicker is another turbine-induced effect caused by the rotational movement of the blades that cast moving shadows if the sun is behind them. This effect occurs in the morning or evening hours when the incidence angle of the sun is low and generally affects the zone to the west and to the east of the turbines. The shadow flicker model implemented in openWind considers solar declination, sunshine hours and turbine orientation for the calculation.

The digitized single buildings are treated individually as shadow receptors. Note that the resulting map represents the astronomically maximum possible duration of shadowing. Sunshine hours in this context are used to scale the worst-case scenario whereas turbine orientation has a lowering effect on the estimate taking into account times when the turbine is not operational or facing the sun.

The German guidelines specify that shadow flicker should not occur more than 30 minutes per day and not more than 30 hours per year at a specific sensitive location. But today it is possible to make technical arrangements to keep shadow flicker at acceptable levels. The results show that of all the houses, there are only two that reach shadow flicker levels which are slightly above this threshold (31 and 32 hours of shadow flicker per year). Around 95 % of the houses are far beneath a level of concern (Figure 29).

With the produced results of the shadow flicker method, it could be demonstrated that the shadow flicker exposure for the village of Zatric and nearby single or grouped houses is at a tolerable level.

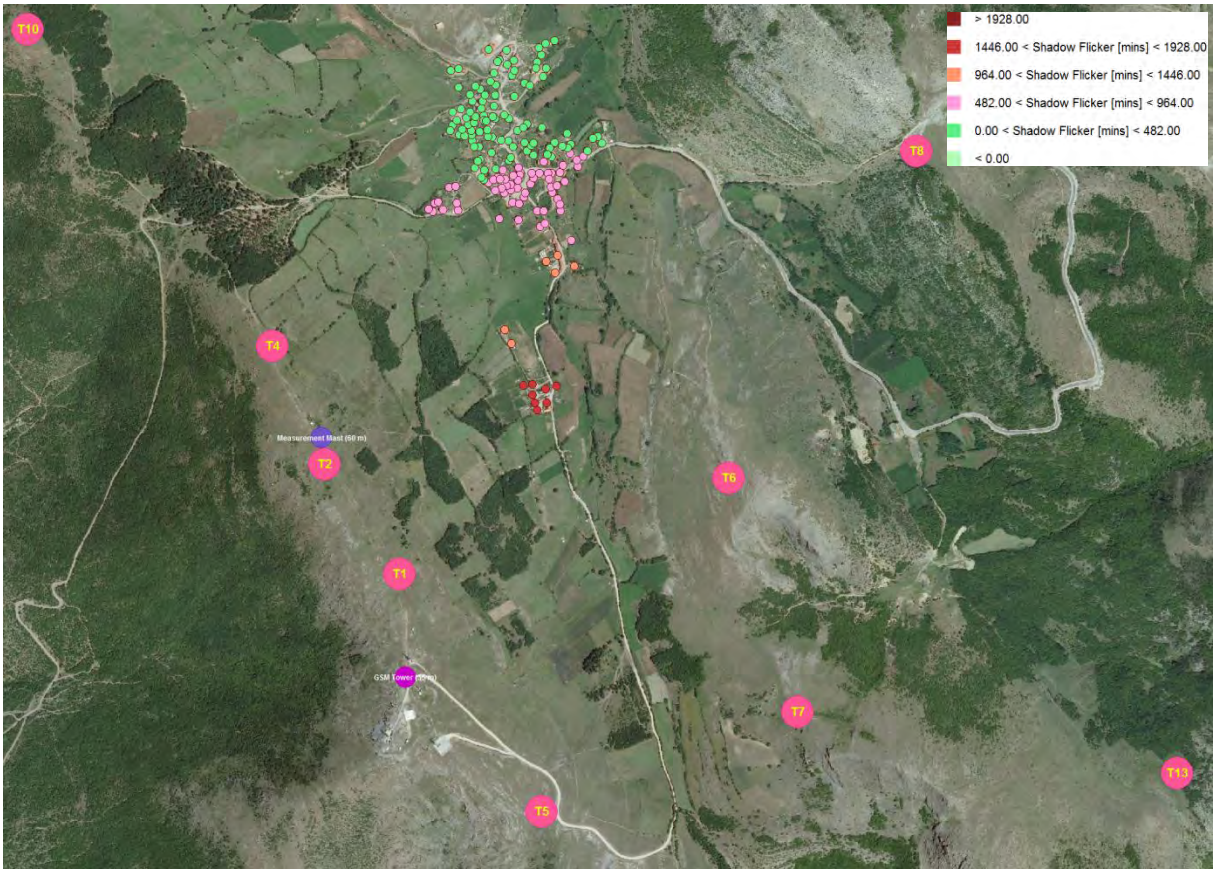


Figure 29: Shadow flicker exposure of all the buildings in Zatric.

9. AUTHORITIES AND LOCAL POPULATION

Next to the technical aspects of the wind park, an important task for NEK during the development of this project was and still is to have a good working relationship with the authorities on the local and national level. Furthermore, NEK was and is also concerned about the local population profiting directly or indirectly from this project. In the following, some of the strategies of NEK are listed, which were applied in order to build-up good and lasting relationships and create a benefit for the involved parties.

Local population:

- **Opportunities for employment.** Whenever any work within the project perimeter had to be done (met mast installation, surveys, electrical installations…), NEK employed people from the village of Zatric to assist their engineers. During the construction phase of the wind park, NEK will be able to provide a great amount of employment for the local population on a temporary basis. During the operation phase of the wind park, a number of jobs will be available in connection with the regular maintenance of the infrastructure, security, aso.

- **Open information policy.** Next to the public hearing and debate in Rahovec in connection with the Environment Impact Assessment, NEK personnel regularly and openly provided information about the planned project when confronted by the local population during one of their numerous site visits. Furthermore, NEK has employed a local villager to service their measurement equipment in Zatric, who in the same time acts as a contact person between NEK and the local population.

- **Creating awareness and acceptance of the project.** As the wind park Zatric will be the first project of this kind in Kosovo, NEK believes that a rising interest will lead to people wanting to visit and view the wind park. This may lead to an increase in commercial activities in Zatric (so a further economic benefit), but may also create a certain degree of prestige for the village and pride with the local population.

- **Creating direct and indirect benefits.** As the wind park Zatric, together with consecutive projects, will lead to a greater power supply security in Kosovo, an indirect benefit for the local population will be less power shortages, which is a current issue in Kosovo. Some of the infrastructure of the wind park like access roads and the new overhead line to Rahovec can also be used for the benefit of the village and will lead

to a better infrastructure. This can be seen as a direct benefit. A further scheme would be to provide the village with free electricity or electricity at a reduced rate as compensation for any negative impacts during the construction and operation phase of the wind park.

Authorities:

- **Regular contact and exchange from the early project stage on.** The wind park Zatric will be the first wind park of any significant size in Kosovo. Likewise, the permitting procedure for such a large scale project is not firmly anchored and sufficiently practiced within the authorities. Therefore, it was very important to get in contact with the local authorities at an early stage of the project in order to evaluate, which documentation is required and which permits have to be obtained. Once the initial contact was set-up, a regular exchange between NEK and the respective authorities took and takes place to ensure that the permitting procedure is followed correctly by NEK and that all required documentation is present.

- **Highlighting the overall benefit for the energy supply of Kosovo.** In the end effect, it will be the country of Kosovo that will benefit through the success of any renewable energy project within the country. While dealing with the authorities, NEK highlighted this fact and encouraged participiation in making this wind energy project possible.

- **Providing clear and comprehensive project documentations.** The permitting procedure in Kosovo requires comprehensive documentations. The projects have to be presented in precise and adequate form and a vast number of official documents have to be obtained and passed on to the responsible authorities. For a successful application, the exact terms of the relevant guidelines have to be followed or otherwise, the application will be rejected.

- **Giving feed-backs to renewable energy policies and frameworks.** In the last years, the Government of Kosovo has released a number of measures to promote renewable energies in the country. Some measures were released during the period of this project development. As a developer of three major wind park projects in Kosovo, NEK was directly affected by some of these changes and was able to give a realistic and beneficial feed-back to the authorities.

10. TASKS AND PROJECT ORGANISATION

10.1. TASKS

In the following, the necessary tasks for the planning, construction and operation of the project are outlined. NEK Umwelttechnik AG has been assigned by Upwind International I GmbH to carry out all engineering tasks for this project and to evaluate potential building contractors for the necessary infrastructure. Upwind International I GmbH represented through its local branch Upwind Kosovo I Ltd. is the project owner and will be responsible for the operation of the wind park, obtaining all necessary licenses and contracts and setting up agreements with the investor.

The following tasks are already concluded or will be concluded in the months to come:

Planning phase:

- Feasibility study (concluded)
- Preliminary land agreements (concluded)
- First wind measuring campaign (concluded)
- Second wind measuring campaign - bankable (15.5.12 - 14.5.13 - concluded)
- Definitive wind assessment (15.5.12 - 14.5.13 - constantly updated)
- Grid connection project (concluded)
- Environmental Impact Assessment (concluded); environmental permit issued
- Road study (concluded)
- Application at ERO for authorization (concluded)
- Preliminary construction and operation permit by ERO (issued on March 01, 2013)
- Land lease contracts with KFA and private owners for wind park (concluded)
- Land lease contracts with private owners for OHL to Rahovec (ongoing)
- Definitive technical project wind park (concluded - detailed engineering initiated)
- Geotechnical survey (initiated)
- Definitive technical project grid connection (initiated, to be concluded by December, 2013)
- Grid connection Agreement with KOSTT (initiated, to be concluded by December, 2013)
- Framework Agreement with turbine manufacturer (ongoing, expected to be concluded by autumn, 2013)

- Power Purchase Agreement KEDS (2014)
- Project fully permitted (winter 2013/2014 - estimation)

Construction phase (schedule depends on investor’s decisions):

- Ordering of turbines (first half of 2014)
- Construction of access roads (first half of 2014)
- Laying of internal electrical grid (first half of 2014)
- Grid connection to feed-in point (2014)
- Construction of third transformer at Rahovec (2014)
- Foundation works for turbines (2014)
- Delivery of turbines (second half of 2014)
- Turbine installation (second half of 2014)
- Test operation (winter 2014 / 2015)

➔ **Commissioning of wind park (first 3 months of 2015)**

Operation phase:

- Regular maintenance of turbines
- Monitoring of performance
- Replacement of components
- Energy production
- Projected life time: 20 years

➔ **Decommissioning or re-launch**

10.2. PROJECT ORGANISATION

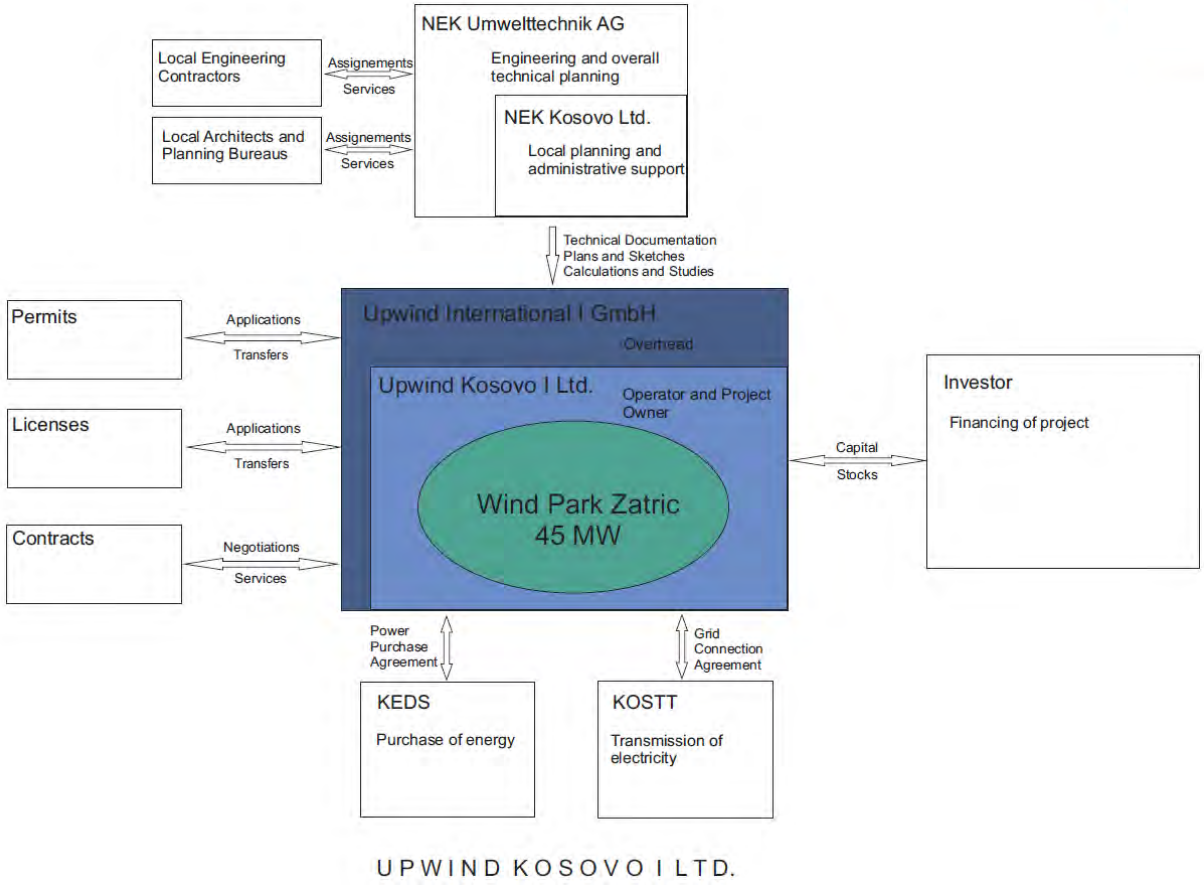


Figure 30: Schematic of project organisation.

11. ECONOMICAL ANALYSIS

11.1. PROJECT COST ESTIMATION

Below is summarized a rough cost estimation for the construction of the 45 MW wind farm at Zatric consisting of 15 turbines Siemens SWT-3.0-113 with 99.5 m hub height. The amounts are subjected to changes, calculated in € and subjected to VAT and import taxes.

Estimated Investment Cost for WP Zatric:

- Wind turbines (15 pieces SWT 3.0 MW, 99.5 m HH)	approx.	€	49’500’000.00
- De-Icing devices for the turbines	approx.	€	2’500’000.00
- Transportation to Kosovo	approx.	€	incl.
- Transportation on to site	approx.	€	incl.
- Transportation and installation insurances	approx.	€	incl.
- Foundation work	approx.	€	3’500‘000.00
- Internal roads, platforms	approx.	€	3’500’000.00
- Access roads, improvements	approx.	€	2’500’000.00
- Internal grid connection	approx.	€	500’000.00
- External grid connection to SS Rahovec	approx.	€	800’000.00
- Upgrading of existing substation	approx.	€	1’100’000.00
- Geotechnical studies, drillings	approx.	€	350‘000.00
- Wind measurements, modelling	approx.	€	900‘000.00
- PPA negotiations, grid connection issues	approx.	€	600‘000.00
- Technical projects	approx.	€	1’400‘000.00
- Environmental studies	approx.	€	125‘000.00
- Permissions, licenses, fees	approx.	€	500‘000.00
- Erection of turbines, start of operation	approx.	€	incl.
- Supervision of construction	approx.	€	incl.
- Financing (through investor)	approx.	€	0.00
- Preliminary land lease	approx.	€	250’000.00
- Project Development, success fee. Etc.	approx.	€	3’500’’000.00
- Contingencies	approx.	€	1’000‘000.00
Total	**approx.**	**€**	**72’525’000.00**

11.2. ECONOMICAL CALCULATION

In Annex I, detailed economical calculations for various scenarios are presented. As input for these calculations, the estimated annual energy yield as shown in chapter 5.4 is used. Based on the current legal framework, a feed-in tariff of 85 € / MWh for the duration of 10 years is assumed. After this, a mixed tariff of 54 € / MWh, derived from the current regular electricity prices in Kosovo and estimations of a market based feed-in tariff for renewable energies, is assumed. The cost of capital is one of the major factors in determing the economic viability of the wind park. We assume a loan over 70% of the total investment value, on which an annual interest rate of between 3.25% and 5.5% has to be paid (Scenario 1 - 3). Scenario 4 takes into account that part of the project could be financed through an EU grant. The annual energy yield is set at 120’000 MWh, which is roughly the average between the WAsP and the openWind energy production calculations.

- **Scenario 1.** Feed-in tariff: 10 years fixed (85 Euro / MWh) and 10 years mixed market based (54 Euro / MWh). Capital cost (interest rate): **4.5%.**

- **Scenario 2.** Feed-in tariff: 10 years fixed (85 Euro / MWh) and 10 years mixed market based (54 Euro / MWh). Capital cost (interest rate): **3.25%.**

- **Scenario 3.** Feed-in tariff: 10 years fixed (85 Euro / MWh) and 10 years mixed market based (54 Euro / MWh). Capital cost (interest rate): **5.5%.**

- **Scenario 4.** Feed-in tariff: 10 years fixed (85 Euro / MWh) and 10 years mixed market based (54 Euro / MWh). Capital cost (interest rate): **5.5%,** EU Grant: **12.5 Mio Euro.**

All four scenarios result in a net profitable project and the detailed figures can be reviewed in the respective calculations in Annex I. One uncertainty factor is the mixed market based feed-in tariff, when the fixed feed-in tariff expires after 10 years. However, even with reduced feed-in tariffs for the remainder of the project, life time interest rates for stock capital and loans as well as the operational costs can be covered. Still, NEK strongly recommends to the policy makers of Kosovo to offer fixed feed-in tariffs for the whole average minimum life span of a wind park of at least 20 years.

12. LESSONS LEARNED AND KNOWLEDGE GAINED

Zatric will be the first wind park that NEK has developed in Kosovo, but by no means their first wind park development worldwide. Therefore, we have tried to incorporate all the country and project specific experiences into our general know-how.

- **Country specific permitting process.** Each country has got its own rules and regulations concerning the permits, contracts and authorizations required for the construction and operation of a wind park. On project start, much effort is necessary for finding out precisely which authority requires which documentation and in which form. In Kosovo, we made the experience that every documentation has to be submitted in precisely the correct form and manner or otherwise it may be rejected. On the other hand, the guidelines often aren’t formulated in such a way that it becomes clear to the applicant what exactly is required from him. Having gone through the complete permitting procedure for the wind park Zatric gives us an unique advantage in efficiently obtaining permits for further wind energy projects to be developed in Kosovo.

- **Planning a wind park in complex terrain.** From the topographical perspective, Zatric is not an easy area for planning and constructing a wind park. Nevertheless, the good wind potential encouraged us to do exactly this. During various surveys and site investigations, we could build up specific regional knowledge and gain valuable insight in how to plan the infrastructure of a wind park under challenging site conditions. Comprehensive wind measurements throughout the whole of Kosovo from one of our previous campaigns have shown that only on the slopes and mountain ridges of the country the wind potential is high enough to make a wind park development economically feasible. Therefore, knowledge of how to plan and construct a wind park in complex terrain will be mandatory for further project developments in this country.

- **Working with the locals.** However remote a wind park may be located, there always will be local stakeholder, who may have a positive or negative interest in the project. As this project is located in the vicinity of the village of Zatric, we were encouraged from an early stage on to work together with the local population and maintain an open information policy. Only by also generating a benefit for the local population like employment opportunities, subsidized electricity or by stimulating local commerce can a broad acceptance of the project be achieved.

13. OUTLOOK

13.1. BANKABLE WIND ASSESSMENT

The results of the second wind measurement campaign (with the 60 m met mast) shown in this feasibility study represent a first detailed analysis of the data and a reliable evaluation of the wind potential. To make this first assessment bankable, a more thorough data analysis will be carried out including adjustments to long term climate conditions. This time intensive task has been initiated one month ago and will be concluded in the months to come. The purpose of a bankable wind assessment is to provide a solid decision basis for financing institutions.

13.2. GEOTECHNICAL SURVEY

In order to design the foundations of the wind turbines correctly and to determine if any additional fortifications (i.e. foundation piles, rock anchors) are required, a detailed geotechnical survey will be necessary. Preparation works for this survey have been initiated. It is planned to conduct a series of sounding drillings at the turbine sites to get precise information about the local geological situation. We will also conduct some additional sounding drillings at some of the critical access road sections.

13.3. FINAL PERMITTING AND CONTRACTS

Up to the end of 2013, all still missing permits and contracts for the realization of the wind park Zatric should be obtained, so that construction works may commence in the spring of 2014. Up to now, the permitting procedure was very successful and we were already able to obtain a number of important permits and contracts for this wind park.

13.4. REALIZATION OF THE WIND PARK

We estimate that the overall technical planning will be finished up to the end of this year and that construction works may commence in spring, 2014, as soon as the weather conditions allow it. If the construction works and the installation of the turbines all go according to plan, the wind park should be fully operational from the end of 2014 onwards.

13.5. DEVELOPMENT OF CONSECUTIVE PROJECTS IN KOSOVO

NEK will use it’s experiences which it has gained during the development of this wind park for further wind energy projects in Kosovo. In fact, we have already started professional wind measurements for two further projects of about the same size and have initiated the permitting and technical planning process. We are confident that the experiences made in Zatric will help us to develop these further projects even more efficiently.

NEK UMWELTTECHNIK AG

Dr. Ch. Kapp S. Schneeberger

Zurich, September 09, 2013 Kp/Af/Sb/re

Annexes: - Economic Calculations

Annex I

Economic Calculations

Financial and Economic Analysis - Wind Park Zatric

Calculation Scenario A

Feed-in Tariff

10 years fixed (85 Euro / MWh) and 10 years market based (54 Euro / MWh)

Capital cost (interest rate)

4.5 % / Year

Project:
KOSOVO_Zatric_Windbank_040913

Description:
Financial and economic analysis of the wind park Zatric with 15 Siemens SWT-3.0-113 turbines and a 10-year feed-in tariff of 85 €/MWh. In this scenario, an interest rate of 4.5% is assumed.

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Economy: WINDBANK (Financial & Economic analysis) - Main Result

Calculation: WP Zatric - Interest Rate 4.5

TURN-KEY BUDGET (Amount in € excl. VAT)

		Fixed assets	Operating Costs
Turbines incl. Cold Climate Kit	:	52'000'000	-
Foundation	:	3'500'000	-
Access Roads, Platforms	:	6'000'000	-
Electrical Works	:	2'400'000	-
Project Development	:	8'625'000	-
Total	**:**	**72'525'000**	**0**

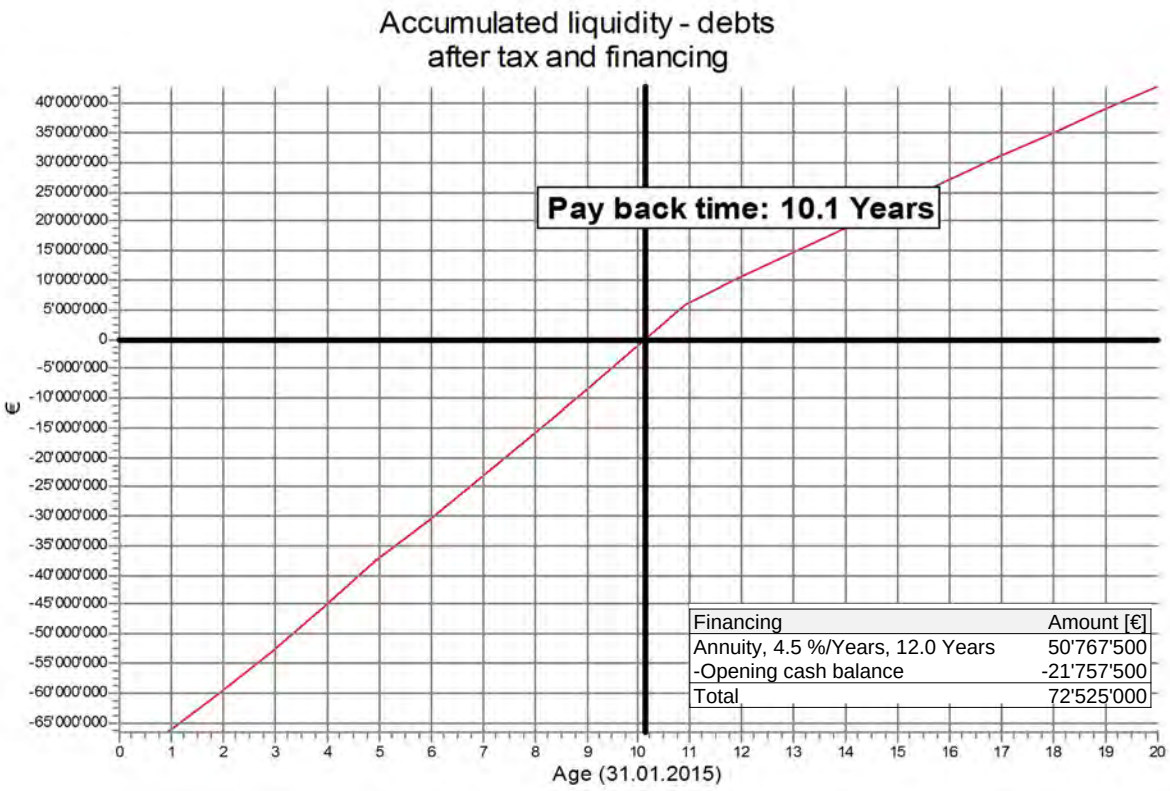
Total Turn-Key Price: **72'525'000** **Cost per 1'000 kWh** **604 €**

Profit and loss account (before financing) (Amount in € excl. VAT)

Income (electricity)			Years: 1		Years: 6		Mean of 20 years Deflated	
Description	Adjustment	MWh/Years	€/kWh	total	€/kWh	total	€/kWh	total
Feed-in Tariff	Annual values	120'000	0.0850	10'200'000	0.0850	10'200'000	0.0539	6'469'945
Total, electricity			0.0850	10'200'000	0.0850	10'200'000	0.0539	6'469'945
-O&M and transferences:			0.0000	0	0.0131	1'575'000	0.0098	1'181'250
Annual profit before tax and financing			0.0850	10'200'000	0.0719	8'625'000	0.0441	5'288'695
Profit in % of investment				14 %		12 %		7 %

Return on investment: 29.8 %
Internal rate of return: 10.7% *)

)In Windbank all Interest rates are nominal, which approximately are the real interest rate + Inflation. The NPV and IRR are based on nominal interest rates as well.



Project:
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Description:
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Economy: WINDBANK (Financial & Economic analysis) - Assumptions and ratios

Calculation: WP Zatric - Interest Rate 4.5

WTG PARK

ENERGY CALCULATION

Calculated Energy prod.	120'000 MWh/Years

VALUE OF ENERGY PRODUCTION

Years	€/kWh	Years	€/kWh	Years	€/kWh
2015	0.0850	2022	0.0850	2029	0.0540
2016	0.0850	2023	0.0850	2030	0.0540
2017	0.0850	2024	0.0850	2031	0.0540
2018	0.0850	2025	0.0850	2032	0.0540
2019	0.0850	2026	0.0540	2033	0.0540
2020	0.0850	2027	0.0540	2034	0.0540
2021	0.0850	2028	0.0540	2035	0.0540

TURN-KEY BUDGET (Amount in € excl. VAT)

D1	Turbines incl. Cold Climate Kit	52'000'000
D1	Foundation	3'500'000
D1	Access Roads, Platforms	6'000'000
D1	Electrical Works	2'400'000
D1	Project Development	8'625'000
	Net installation price	**72'525'000**
	Cost per 1'000 kWh	**604**
	Total entitled depreciation amount	72'525'000
	Total O&M expenditure	0

D) Entry is included in the depreciation amount
I) Entry is included in the calculation of the insurance premium
O) Entry is divided linearly over the period in question

MISCELLANEOUS

Expected month of installation	01.2015
Expected life span	20 Years
Inflation	3.5 %
First regulation of inflation	1. January 2016

INFORMATION ON PURCHASER

Company owned WTG	
Tax on operation and depreciation	0.0 %
Tax on interests	0.0 %
Depreciation: Maximum annual depreciation	10.0 %

FINANCING

Type of loan	Amount [€]	Term [years]	Interest rate [%]
Annuity	50'767'500	12	4.5

Opening cash balance (yields interest)	-21'757'500 [€]
Interests on negative cash balance	8.0 %
Interests on positive cash balance	1.0 %
Tax savings are used to pay off loans	

OPERATION AND TRANSFERENCES

Annual O&M expenditures		Years
Total O&M Costs:	35.00 €/kW inst. capacity	6->

RATIOS

		/kW	/m2	/MWh
Preliminary expenses	€	1'612	-	604
O&M costs	average €/years	26.3	-	9.8
Energy production	kWh/Years	2'667	-	-

Minimum life span for redemption of loan	10.1 Years
Simple pay back time	8.8 Years
Acc. liquidity, deflated	21'597'410 [€]
in % of investment	29.8 %
Net present value (Interest rate=6.0%)	17'808'269 [€]
Internal rate of return	10.7 %
Return on investment	29.8 %
Production price at calculation interest 6.0%	0.0776 €/kWh

Key figures, explanations:
Minimum life span for redemption of loan is the year, where accumulated liquidity (amount on saving account for all liquidity) exceeds the remaining debt.
Simple pay back time is the number of years needed to pay back the investment + operation costs within pay back time. Finance costs, tax and inflation are not included.
Acc. liquidity, deflated, is the total accumulated profit at the end of the project (includes tax etc.), deflated. Same in % of investment is a good indicator of the expected value of the project for the private investor.
Net present value (interest rate
Internal rate of return is the discount rate that results in a net present value of zero for the cash flow. Here is included all payments; investment, O&M, sales of energy etc., but not tax and finance. Should minimum be X as defined above.
Production costs at calculation interest X% is calculated as investment + discounted costs over life time with interest rate X divided with energy production over life time. The calculation interest X is defined as above.

Project:
KOSOVO_Zatric_Windbank_040913

Description:
Financial and economic analysis of the wind park Zatric with 15 Siemens SWT-3.0-113 turbines and a 10-year feed-in tariff of 85 €/MWh. In this scenario, an interest rate of 4.5% is assumed.

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Economy: WINDBANK (Financial & Economic analysis) - Budgets for liquidity and profit/loss

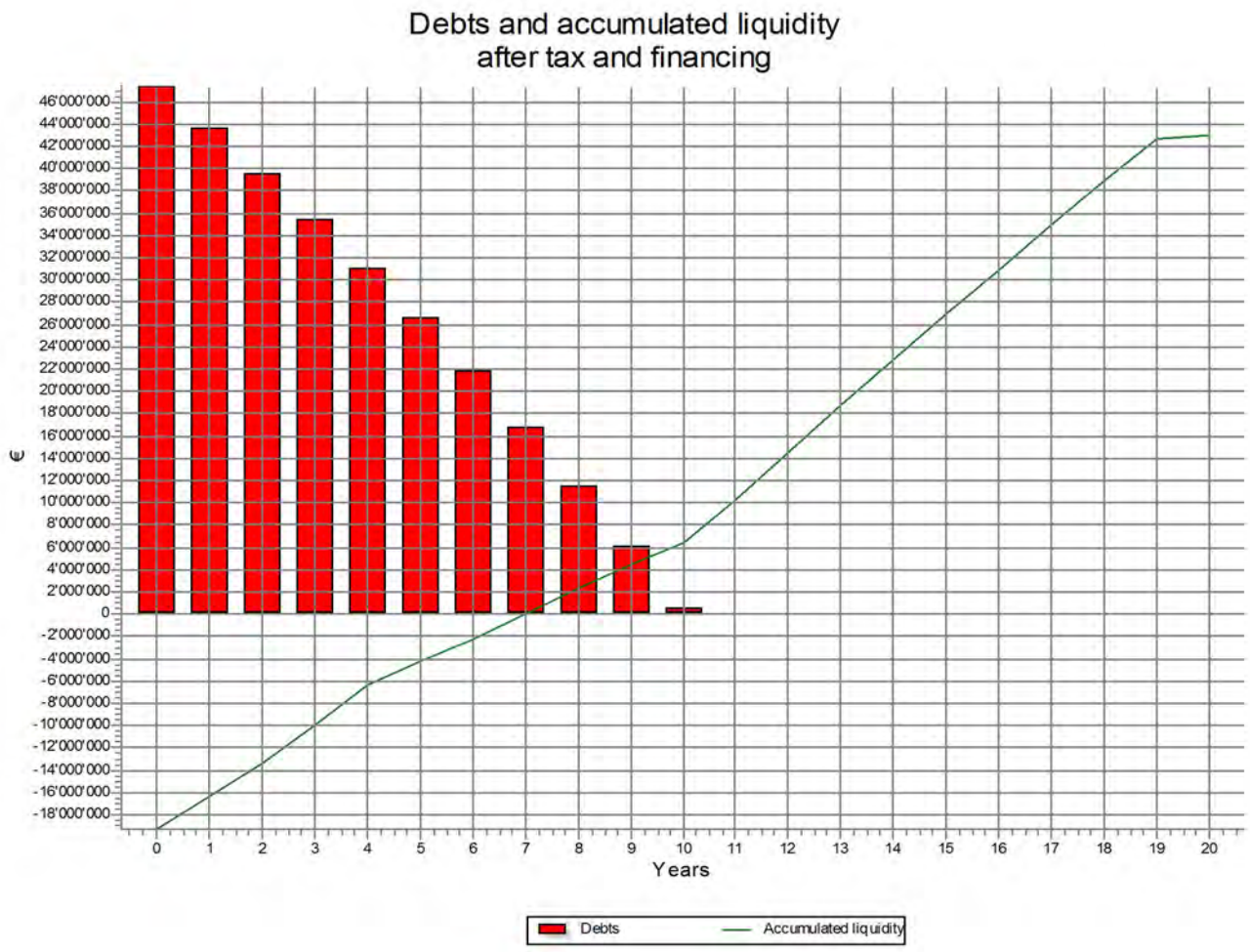
Calculation: WP Zatric - Interest Rate 4.5

CASH FLOW - amount in €

Calendar year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2035
Age	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**20**
INCOME	**9'350'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'210'642**	**10'211'552**	**10'233'040**	**10'254'006**	**6'563'098**	**575'666**
Sale of electricity	9'350'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	6'480'000	540'000
Interests, cash balance	0	0	0	0	0	0	0	10'642	11'552	33'040	54'006	83'098	35'666
EXPENDITURES	**6'909'147**	**7'327'825**	**7'098'051**	**6'849'895**	**6'581'886**	**8'075'748**	**8'136'017**	**7'956'237**	**8'026'371**	**8'098'960**	**8'174'090**	**2'795'489**	**261'160**
Operating Costs	0	0	0	0	0	1'714'722	1'936'077	2'003'840	2'073'974	2'146'563	2'221'693	2'299'452	261'160
Repayment on loans	3'362'205	3'819'159	3'991'021	4'170'617	4'358'295	4'554'418	4'759'367	4'973'538	5'197'347	5'431'228	5'675'633	474'676	0
Interests on loans	2'094'159	2'133'238	1'961'376	1'781'780	1'594'103	1'397'979	1'193'031	978'859	755'050	521'169	276'764	21'360	0
Interests on cash balance	1'452'783	1'375'428	1'145'654	897'498	629'489	408'629	247'543	0	0	0	0	0	0
PROFITS	**2'440'853**	**2'872'175**	**3'101'949**	**3'350'105**	**3'618'114**	**2'124'252**	**2'063'983**	**2'254'405**	**2'185'181**	**2'134'080**	**2'079'916**	**3'767'609**	**314'506**
Cash balance	**-19'316'647**	**-16'444'472**	**-13'342'522**	**-9'992'417**	**-6'374'303**	**-4'250'051**	**-2'186'068**	**68'337**	**2'253'517**	**4'387'597**	**6'467'513**	**10'235'122**	**42'974'285**
Debts	**47'405'296**	**43'586'136**	**39'595'116**	**35'424'500**	**31'066'206**	**26'511'788**	**21'752'422**	**16'778'884**	**11'581'537**	**6'150'309**	**474'676**	**0**	**0**

Profit and loss account - amount in €

Calendar year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2035
Age	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**20**
INCOME, Energy prod.	**9'350'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**6'480'000**	**540'000**
EXPENDITURES before interests and depreciations	**0**	**0**	**0**	**0**	**0**	**1'714'722**	**1'936'077**	**2'003'840**	**2'073'974**	**2'146'563**	**2'221'693**	**2'299'452**	**261'160**
Total O&M Costs	0	0	0	0	0	1'714'722	1'936'077	2'003'840	2'073'974	2'146'563	2'221'693	2'299'452	261'160
WORKING PROFITS	**9'350'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**8'485'278**	**8'263'923**	**8'196'160**	**8'126'026**	**8'053'437**	**7'978'307**	**4'180'548**	**278'840**
SIMPLE RETURN ON INVESTMENT (%)	**14**	**14**	**14**	**14**	**14**	**12**	**11**	**11**	**11**	**11**	**11**	**6**	**5**



Project:
KOSOVO_Zatric_Windbank_040913

Description:
Financial and economic analysis of the wind park Zatric with 15 Siemens SWT-3.0-113 turbines and a 10-year feed-in tariff of 85 €/MWh. In this scenario, an interest rate of 4.5% is assumed.

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Calculated:
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Economy: WINDBANK (Financial & Economic analysis) - Detailed listing of economic figures

Calculation: WP Zatric - Interest Rate 4.5

Assumptions

Amount in € (excl. VAT) when nothing is specified. All expenditures are marked with (-).

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Operation																					
INCOME																					
Sale of electricity, 120'000 MWh/Year (Note 1)	9'350'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	540'000
EXPENDITURES	**-3'324'063**	**-3'626'250**	**-3'626'250**	**-3'626'250**	**-3'626'250**	**-5'340'972**	**-5'562'327**	**-5'630'090**	**-5'700'224**	**-5'772'813**	**-5'847'943**	**-5'925'702**	**-6'006'183**	**-6'089'481**	**-6'175'694**	**-6'264'924**	**-6'357'278**	**-6'452'864**	**-6'551'795**	**-6'654'190**	**-563'347**
Operation and maintenance (Note 2)	0	0	0	0	0	-1'714'722	-1'936'077	-2'003'840	-2'073'974	-2'146'563	-2'221'693	-2'299'452	-2'379'933	-2'463'231	-2'549'444	-2'638'674	-2'731'028	-2'826'614	-2'925'545	-3'027'940	-261'160
Depreciation (Straight-line over 20 years)	-3'324'063	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-302'188
WORKING PROFITS, ORDINARY	**6'025'938**	**6'573'750**	**6'573'750**	**6'573'750**	**6'573'750**	**4'859'028**	**4'637'673**	**4'569'910**	**4'499'776**	**4'427'187**	**4'352'057**	**554'298**	**473'817**	**390'519**	**304'306**	**215'076**	**122'722**	**27'136**	**-71'795**	**-174'189**	**-23'347**
FINANCING	**-3'546'943**	**-3'508'666**	**-3'107'030**	**-2'679'278**	**-2'223'592**	**-1'806'608**	**-1'440'574**	**-968'217**	**-743'498**	**-488'129**	**-222'758**	**61'737**	**122'852**	**164'664**	**206'048**	**246'967**	**287'389**	**327'274**	**366'586**	**405'285**	**35'666**
Interests, loans (Note 3)	-2'094'159	-2'133'238	-1'961'376	-1'781'780	-1'594'103	-1'397'979	-1'193'031	-978'859	-755'050	-521'169	-276'764	-21'360	0	0	0	0	0	0	0	0	0
Interests, cash balance (Note 4)	-1'452'783	-1'375'428	-1'145'654	-897'498	-629'489	-408'629	-247'543	10'642	11'552	33'040	54'006	83'098	122'852	164'664	206'048	246'967	287'389	327'274	366'586	405'285	35'666
Working profits	**2'478'995**	**3'065'084**	**3'466'720**	**3'894'472**	**4'350'158**	**3'052'420**	**3'197'099**	**3'601'693**	**3'756'278**	**3'939'058**	**4'129'299**	**616'035**	**596'669**	**555'184**	**510'354**	**462'043**	**410'111**	**354'410**	**294'791**	**231'095**	**12'319**
BALANCE																					
ASSETS	**49'884'290**	**49'130'216**	**48'605'915**	**48'329'771**	**48'321'635**	**46'819'636**	**45'257'369**	**43'885'524**	**42'444'455**	**40'952'285**	**39'405'951**	**39'547'310**	**40'143'978**	**40'699'162**	**41'209'516**	**41'671'559**	**42'081'670**	**42'436'080**	**42'730'871**	**42'961'966**	**42'974'285**
Installation	69'200'938	65'574'688	61'948'438	58'322'188	54'695'938	51'069'688	47'443'438	43'817'188	40'190'938	36'564'688	32'938'438	29'312'188	25'685'938	22'059'688	18'433'438	14'807'188	11'180'938	7'554'688	3'928'438	302'188	0
Cash balance	-19'316'647	-16'444'472	-13'342'522	-9'992'417	-6'374'303	-4'250'051	-2'186'068	68'337	2'253'517	4'387'597	6'467'513	10'235'122	14'458'041	18'639'475	22'776'078	26'864'371	30'900'732	34'881'393	38'802'434	42'659'779	42'974'285
LIABILITIES	**49'884'290**	**49'130'216**	**48'605'915**	**48'329'771**	**48'321'635**	**46'819'636**	**45'257'369**	**43'885'524**	**42'444'455**	**40'952'285**	**39'405'951**	**39'547'310**	**40'143'978**	**40'699'162**	**41'209'516**	**41'671'559**	**42'081'670**	**42'436'080**	**42'730'871**	**42'961'966**	**42'974'285**
Net worth	2'478'994	5'544'080	9'010'799	12'905'271	17'255'429	20'307'848	23'504'947	27'106'640	30'862'918	34'801'976	38'931'275	39'547'310	40'143'978	40'699'162	41'209'516	41'671'559	42'081'670	42'436'080	42'730'871	42'961'966	42'974'285
Debt (Note 3)	47'405'296	43'586'136	39'595'116	35'424'500	31'066'206	26'511'788	21'752'422	16'778'884	11'581'537	6'150'309	474'676	0	0	0	0	0	0	0	0	0	0
Liquidity of the year (This year's cash balance growth minus transferences) (after tax)																					
	2'440'853	2'872'175	3'101'949	3'350'105	3'618'114	2'124'252	2'063'983	2'254'405	2'185'181	2'134'080	2'079'916	3'767'609	4'222'919	4'181'434	4'136'604	4'088'293	4'036'361	3'980'660	3'921'041	3'857'345	314'506

Project:
KOSOVO_Zatric_Windbank_040913

Description:
Financial and economic analysis of the wind park Zatric with 15 Siemens SWT-3.0-113 turbines and a 10-year feed-in tariff of 85 €/MWh. In this scenario, an interest rate of 4.5% is assumed.

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Economy: WINDBANK (Financial & Economic analysis) - Notes regarding Detailed listing of economic figures

Calculation: WP Zatric - Interest Rate 4.5

Amount in € (excl. VAT) when nothing is specified. All expenditures are marked with (-).

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Note 1: Electricity prices																					
Feed-in Tariff (€/kWh)	0.0850	0.0850	0.0850	0.0850	0.0850	0.0850	0.0850	0.0850	0.0850	0.0850	0.0850	0.0540	0.0540	0.0540	0.0540	0.0540	0.0540	0.0540	0.0540	0.0540	0.0540
Note 2: Operation and maintenance																					
Total O&M Costs	0	0	0	0	0	1'714'722	1'936'077	2'003'840	2'073'974	2'146'563	2'221'693	2'299'452	2'379'933	2'463'231	2'549'444	2'638'674	2'731'028	2'826'614	2'925'545	3'027'940	261'160
Note 3: Loan																					
Annuity, 4.5 %/Years, 12.0 Years																					
Debts	47'405'296	43'586'136	39'595'116	35'424'500	31'066'206	26'511'788	21'752'422	16'778'884	11'581'537	6'150'309	474'676	0	0	0	0	0	0	0	0	0	0
Repayment	3'362'205	3'819'159	3'991'021	4'170'617	4'358'295	4'554'418	4'759'367	4'973'538	5'197'347	5'431'228	5'675'633	474'676	0	0	0	0	0	0	0	0	0
Interest rates	2'094'159	2'133'238	1'961'376	1'781'780	1'594'103	1'397'979	1'193'031	978'859	755'050	521'169	276'764	21'360	0	0	0	0	0	0	0	0	0
Note 4: Interests on cash balance																					
1.0 % of positive cash balance	0	0	0	0	0	0	0	10'642	11'552	33'040	54'006	83'098	122'852	164'664	206'048	246'967	287'389	327'274	366'586	405'285	35'666
8.0 % of negative cash balance	1'452'783	1'375'428	1'145'654	897'498	629'489	408'629	247'543	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxable amount	2'097'500	3'672'750	4'325'475	4'912'928	5'441'635	4'202'749	4'409'647	4'727'312	5'004'062	5'243'670	5'449'517	1'904'637	2'051'747	2'173'281	2'271'417	2'348'100	2'405'069	2'443'874	2'465'893	2'472'355	-8'538'507
Sale of electricity	9'350'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	540'000
Operation and maintenance (100.0 %)	0	0	0	0	0	-1'714'722	-1'936'077	-2'003'840	-2'073'974	-2'146'563	-2'221'693	-2'299'452	-2'379'933	-2'463'231	-2'549'444	-2'638'674	-2'731'028	-2'826'614	-2'925'545	-3'027'940	-261'160
Depreciation 100.0 % of a*b	-7'252'500	-6'527'250	-5'874'525	-5'287'073	-4'758'365	-4'282'529	-3'854'276	-3'468'848	-3'121'963	-2'809'767	-2'528'790	-2'275'911	-2'048'320	-1'843'488	-1'659'139	-1'493'225	-1'343'903	-1'209'513	-1'088'561	-979'705	-881'735
a) Fiscal depreciation balance	65'272'500	58'745'250	52'870'725	47'583'653	42'825'287	38'542'759	34'688'483	31'219'634	28'097'671	25'287'904	22'759'113	20'483'202	18'434'882	16'591'394	14'932'254	13'439'029	12'095'126	10'885'613	9'797'052	8'817'347	7'935'612
b) Depreciation percentage (%)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

Project:
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Description:
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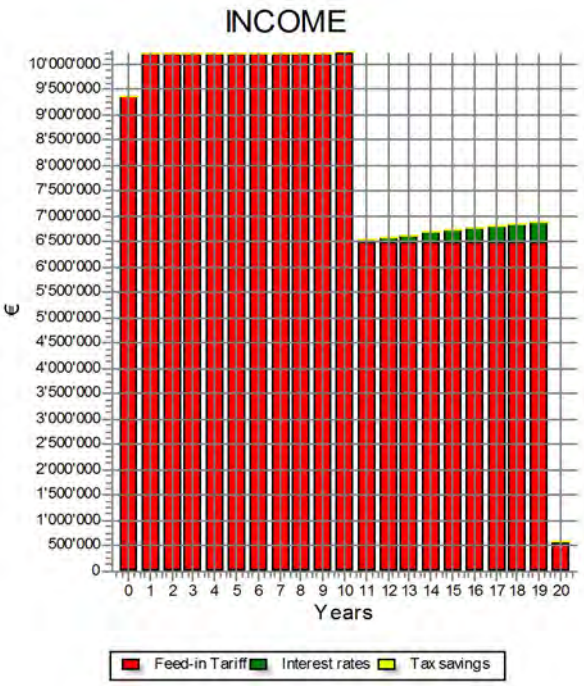
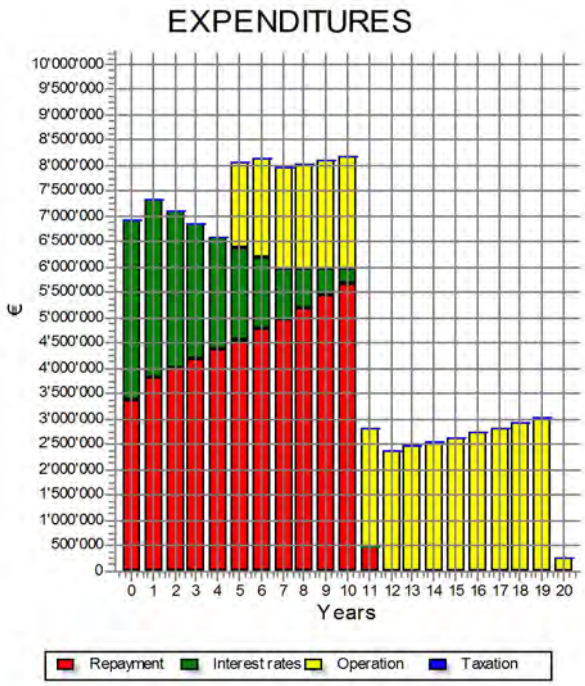
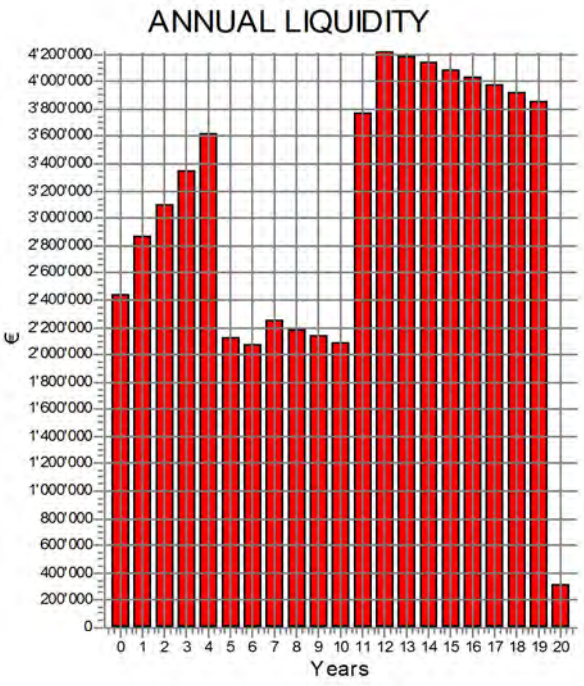
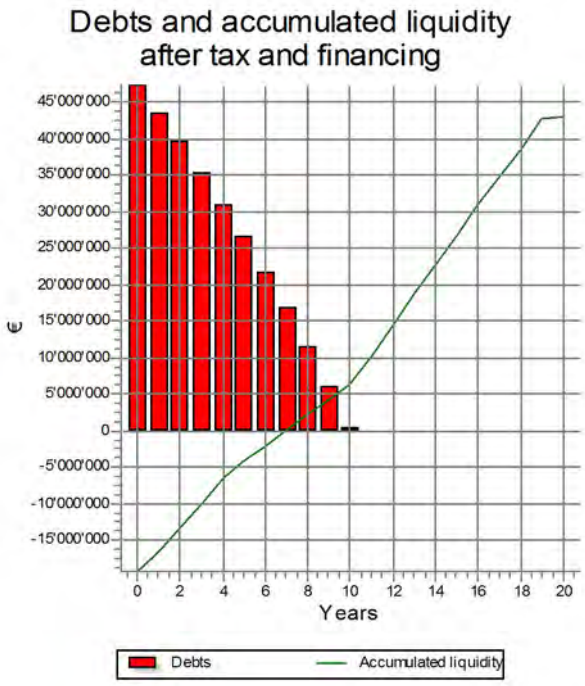
Economy: WINDBANK (Financial & Economic analysis) - Graphs

Calculation: WP Zatric - Interest Rate 4.5









Financial and Economic Analysis - Wind Park Zatric

Calculation Scenario B

Feed-in Tariff

10 years fixed (85 Euro / MWh) and 10 years market based (54 Euro / MWh)

Capital cost (interest rate)

3.25 % / Year (With AAA-rating of World Bank and IFC involvement)

Project:
KOSOVO_Zatric_Windbank_040913

Description:
Financial and economic analysis of the wind park Zatric with 15 Siemens SWT-3.0-113 turbines and a 10-year feed-in tariff of 85 €/MWh. In this scenario, an interest rate of 3.25% is assumed.

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Economy: WINDBANK (Financial & Economic analysis) - Main Result

Calculation: WP Zatric - Interest Rate 3.25

TURN-KEY BUDGET (Amount in € excl. VAT)

		Fixed assets	Operating Costs
Turbines incl. Cold Climate Kit	:	52'000'000	-
Foundation	:	3'500'000	-
Access Roads, Platforms	:	6'000'000	-
Electrical Works	:	2'400'000	-
Project Development	:	8'625'000	-
Total	**:**	**72'525'000**	**0**

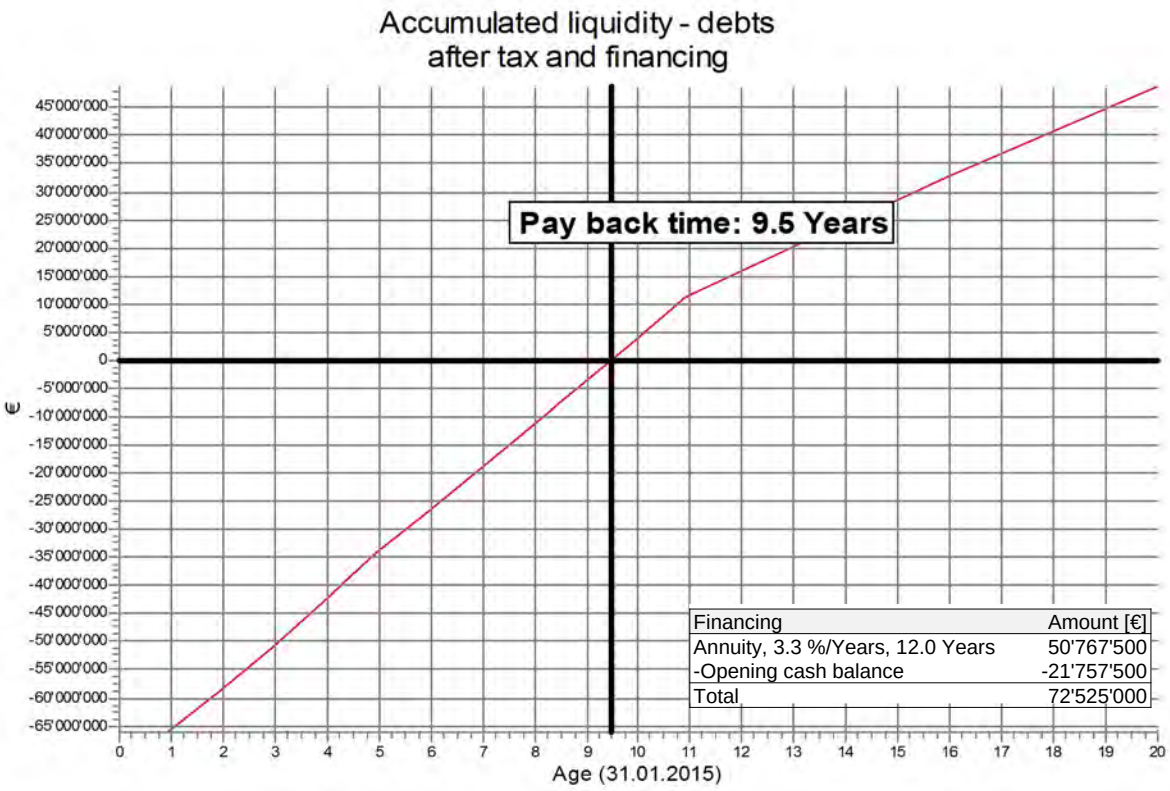
Total Turn-Key Price: 72'525'000 **Cost per 1'000 kWh 604 €**

Profit and loss account (before financing) (Amount in € excl. VAT)

Income (electricity)			Years: 1		Years: 6		Mean of 20 years Deflated	
Description	Adjustment	MWh/Years	€/kWh	total	€/kWh	total	€/kWh	total
Feed-in Tariff	Annual values	120'000	0.0850	10'200'000	0.0850	10'200'000	0.0539	6'469'945
Total, electricity			0.0850	10'200'000	0.0850	10'200'000	0.0539	6'469'945
-O&M and transferences:			0.0000	0	0.0131	1'575'000	0.0098	1'181'250
Annual profit before tax and financing			0.0850	10'200'000	0.0719	8'625'000	0.0441	5'288'695
Profit in % of investment				14 %		12 %		7 %

Return on investment: 33.8 %
Internal rate of return: 10.7% *)

)In Windbank all Interest rates are nominal, which approximately are the real interest rate + Inflation. The NPV and IRR are based on nominal interest rates as well.



Project:
KOSOVO_Zatric_Windbank_040913

Description:
Financial and economic analysis of the wind park Zatric with 15 Siemens SWT-3.0-113 turbines and a 10-year feed-in tariff of 85 €/MWh. In this scenario, an interest rate of 3.25% is assumed.

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Economy: WINDBANK (Financial & Economic analysis) - Assumptions and ratios

Calculation: WP Zatric - Interest Rate 3.25

WTG PARK

ENERGY CALCULATION

Calculated Energy prod.	120'000 MWh/Years

VALUE OF ENERGY PRODUCTION

Years	€/kWh	Years	€/kWh	Years	€/kWh
2015	0.0850	2022	0.0850	2029	0.0540
2016	0.0850	2023	0.0850	2030	0.0540
2017	0.0850	2024	0.0850	2031	0.0540
2018	0.0850	2025	0.0850	2032	0.0540
2019	0.0850	2026	0.0540	2033	0.0540
2020	0.0850	2027	0.0540	2034	0.0540
2021	0.0850	2028	0.0540	2035	0.0540

TURN-KEY BUDGET (Amount in € excl. VAT)

D1	Turbines incl. Cold Climate Kit	52'000'000
D1	Foundation	3'500'000
D1	Access Roads, Platforms	6'000'000
D1	Electrical Works	2'400'000
D1	Project Development	8'625'000
	Net installation price	**72'525'000**
	Cost per 1'000 kWh	**604**
	Total entitled depreciation amount	72'525'000
	Total O&M expenditure	0

D) Entry is included in the depreciation amount
I) Entry is included in the calculation of the insurance premium
O) Entry is divided linearly over the period in question

MISCELLANEOUS

Expected month of installation	01.2015
Expected life span	20 Years
Inflation	3.5 %
First regulation of inflation	1. January 2016

INFORMATION ON PURCHASER

Company owned WTG	
Tax on operation and depreciation	0.0 %
Tax on interests	0.0 %
Depreciation: Maximum annual depreciation	10.0 %

FINANCING

Type of loan	Amount [€]	Term [years]	Interest rate [%]
Annuity	50'767'500	12	3.3

Opening cash balance (yields interest)	-21'757'500 [€]
Interests on negative cash balance	8.0 %
Interests on positive cash balance	1.0 %
Tax savings are used to pay off loans	

OPERATION AND TRANSFERENCES

Annual O&M expenditures		Years
Total O&M Costs:	35.00 €/kW inst. capacity	6->

RATIOS

		/kW	/m2	/MWh
Preliminary expenses	€	1'612	-	604
O&M costs	average €/years	26.3	-	9.8
Energy production	kWh/Years	2'667	-	-

Minimum life span for redemption of loan	9.5 Years
Simple pay back time	8.8 Years
Acc. liquidity, deflated	24'512'716 [€]
in % of investment	33.8 %
Net present value (Interest rate=6.0%)	17'808'269 [€]
Internal rate of return	10.7 %
Return on investment	33.8 %
Production price at calculation interest 6.0%	0.0776 €/kWh

Key figures, explanations:
Minimum life span for redemption of loan is the year, where accumulated liquidity (amount on saving account for all liquidity) exceeds the remaining debt.
Simple pay back time is the number of years needed to pay back the investment + operation costs within pay back time. Finance costs, tax and inflation are not included.
Acc. liquidity, deflated, is the total accumulated profit at the end of the project (includes tax etc.), deflated. Same in % of investment is a good indicator of the expected value of the project for the private investor.
Net present value (interest rate
Internal rate of return is the discount rate that results in a net present value of zero for the cash flow. Here is included all payments; investment, O&M, sales of energy etc., but not tax and finance. Should minimum be X as defined above.
Production costs at calculation interest X% is calculated as investment + discounted costs over life time with interest rate X divided with energy production over life time. The calculation interest X is defined as above.

Project:
KOSOVO_Zatric_Windbank_040913

Description:
Financial and economic analysis of the wind park Zatric with 15 Siemens SWT-3.0-113 turbines and a 10-year feed-in tariff of 85 €/MWh. In this scenario, an interest rate of 3.25% is assumed.

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Economy: WINDBANK (Financial & Economic analysis) - Budgets for liquidity and profit/loss

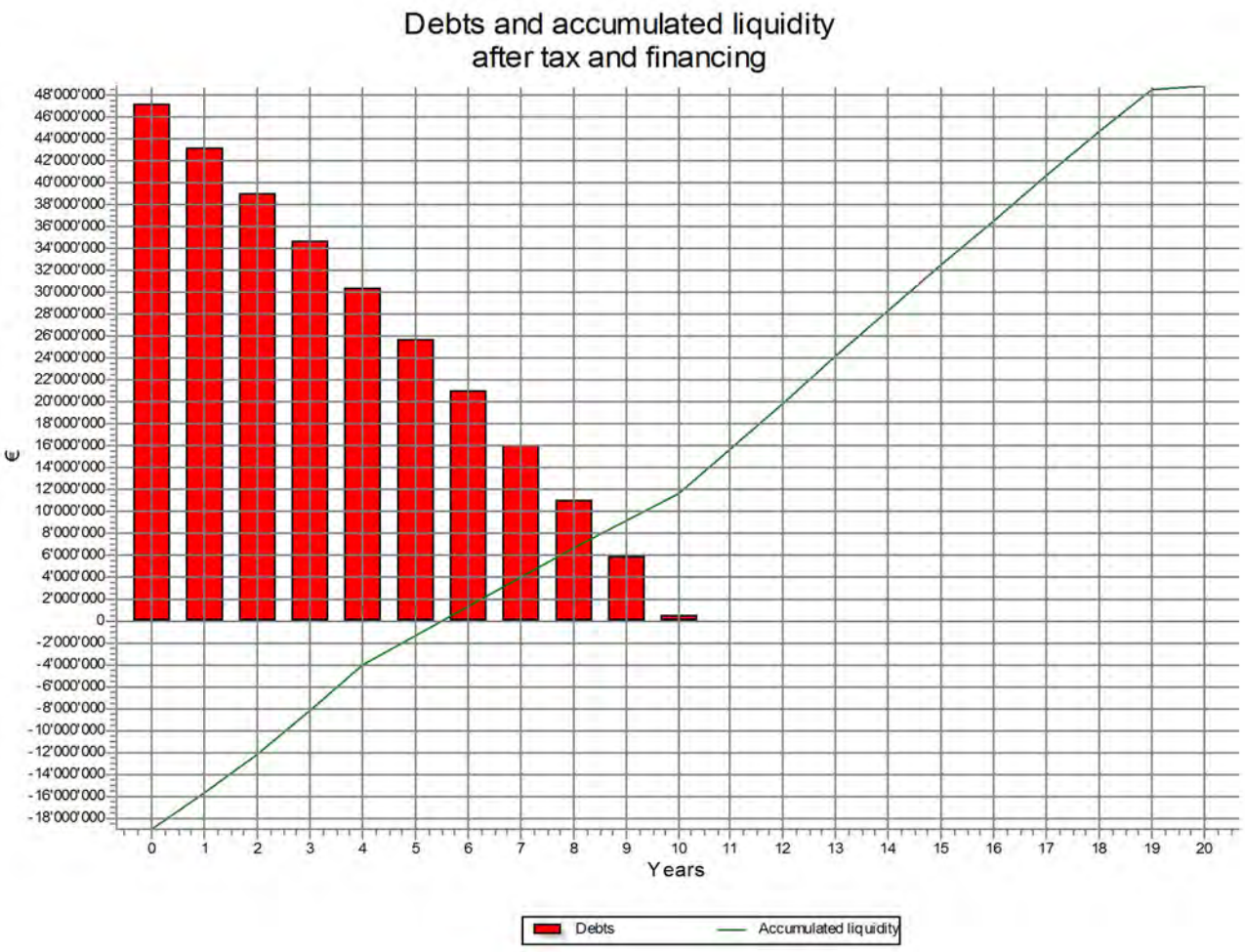
Calculation: WP Zatric - Interest Rate 3.25

CASH FLOW - amount in €

Calendar year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2035
Age	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**20**
INCOME	**9'350'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'194**	**10'226'865**	**10'253'114**	**10'278'912**	**10'304'229**	**6'615'933**	**580'496**
Sale of electricity	9'350'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	6'480'000	540'000
Interests, cash balance	0	0	0	0	0	0	194	26'865	53'114	78'912	104'229	135'932	40'496
EXPENDITURES	**6'539'179**	**6'893'327**	**6'628'793**	**6'343'097**	**6'034'545**	**7'484'619**	**7'499'147**	**7'566'910**	**7'637'044**	**7'709'633**	**7'784'763**	**2'763'047**	**261'160**
Operating Costs	0	0	0	0	0	1'714'722	1'936'077	2'003'840	2'073'974	2'146'563	2'221'693	2'299'452	261'160
Repayment on loans	3'587'033	4'029'705	4'160'670	4'295'892	4'435'509	4'579'663	4'728'502	4'882'178	5'040'849	5'204'676	5'373'828	449'002	0
Interests on loans	1'512'448	1'533'365	1'402'400	1'267'178	1'127'562	983'408	834'569	680'892	522'222	358'394	189'242	14'593	0
Interests on cash balance	1'439'698	1'330'257	1'065'723	780'027	471'474	206'827	0	0	0	0	0	0	0
PROFITS	**2'810'822**	**3'306'673**	**3'571'207**	**3'856'903**	**4'165'456**	**2'715'381**	**2'701'047**	**2'659'956**	**2'616'070**	**2'569'279**	**2'519'466**	**3'852'886**	**319'336**
Cash balance	**-18'946'678**	**-15'640'005**	**-12'068'798**	**-8'211'895**	**-4'046'439**	**-1'331'058**	**1'369'988**	**4'029'944**	**6'646'014**	**9'215'293**	**11'734'759**	**15'587'645**	**48'775'130**
Debts	**47'180'468**	**43'150'764**	**38'990'096**	**34'694'204**	**30'258'696**	**25'679'034**	**20'950'532**	**16'068'354**	**11'027'506**	**5'822'830**	**449'002**	**0**	**0**

Profit and loss account - amount in €

Calendar year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2035
Age	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**20**
INCOME, Energy prod.	**9'350'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**6'480'000**	**540'000**
EXPENDITURES before interests and depreciations	**0**	**0**	**0**	**0**	**0**	**1'714'722**	**1'936'077**	**2'003'840**	**2'073'974**	**2'146'563**	**2'221'693**	**2'299'452**	**261'160**
Total O&M Costs	0	0	0	0	0	1'714'722	1'936'077	2'003'840	2'073'974	2'146'563	2'221'693	2'299'452	261'160
WORKING PROFITS	**9'350'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**8'485'278**	**8'263'923**	**8'196'160**	**8'126'026**	**8'053'437**	**7'978'307**	**4'180'548**	**278'840**
SIMPLE RETURN ON INVESTMENT (%)	**14**	**14**	**14**	**14**	**14**	**12**	**11**	**11**	**11**	**11**	**11**	**6**	**5**



Project:
KOSOVO_Zatric_Windbank_040913

Description:
Financial and economic analysis of the wind park Zatric with 15 Siemens SWT-3.0-113 turbines and a 10-year feed-in tariff of 85 €/MWh. In this scenario, an interest rate of 3.25% is assumed.

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Economy: WINDBANK (Financial & Economic analysis) - Detailed listing of economic figures

Calculation: WP Zatric - Interest Rate 3.25

Assumptions

Amount in € (excl. VAT) when nothing is specified. All expenditures are marked with (-).

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Operation																					
INCOME																					
Sale of electricity, 120'000 MWh/Year (Note 1)	9'350'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	540'000
EXPENDITURES	**-3'324'063**	**-3'626'250**	**-3'626'250**	**-3'626'250**	**-3'626'250**	**-5'340'972**	**-5'562'327**	**-5'630'090**	**-5'700'224**	**-5'772'813**	**-5'847'943**	**-5'925'702**	**-6'006'183**	**-6'089'481**	**-6'175'694**	**-6'264'924**	**-6'357'278**	**-6'452'864**	**-6'551'795**	**-6'654'190**	**-563'347**
Operation and maintenance (Note 2)	0	0	0	0	0	-1'714'722	-1'936'077	-2'003'840	-2'073'974	-2'146'563	-2'221'693	-2'299'452	-2'379'933	-2'463'231	-2'549'444	-2'638'674	-2'731'028	-2'826'614	-2'925'545	-3'027'940	-261'160
Depreciation (Straight-line over 20 years)	-3'324'063	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-302'188
WORKING PROFITS, ORDINARY	**6'025'938**	**6'573'750**	**6'573'750**	**6'573'750**	**6'573'750**	**4'859'028**	**4'637'673**	**4'569'910**	**4'499'776**	**4'427'187**	**4'352'057**	**554'298**	**473'817**	**390'519**	**304'306**	**215'076**	**122'722**	**27'136**	**-71'795**	**-174'189**	**-23'347**
FINANCING	**-2'952'146**	**-2'863'622**	**-2'468'123**	**-2'047'205**	**-1'599'036**	**-1'190'234**	**-834'375**	**-654'027**	**-469'107**	**-279'482**	**-85'013**	**121'340**	**176'377**	**218'725**	**260'649**	**302'115**	**343'087**	**383'530**	**423'404**	**462'671**	**40'496**
Interests, loans (Note 3)	-1'512'448	-1'533'365	-1'402'400	-1'267'178	-1'127'562	-983'408	-834'569	-680'892	-522'222	-358'394	-189'242	-14'593	0	0	0	0	0	0	0	0	0
Interests, cash balance (Note 4)	-1'439'698	-1'330'257	-1'065'723	-780'027	-471'474	-206'827	194	26'865	53'114	78'912	104'229	135'932	176'377	218'725	260'649	302'115	343'087	383'530	423'404	462'671	40'496
Working profits	**3'073'792**	**3'710'128**	**4'105'627**	**4'526'545**	**4'974'714**	**3'668'794**	**3'803'298**	**3'915'883**	**4'030'669**	**4'147'705**	**4'267'044**	**675'638**	**650'194**	**609'244**	**564'955**	**517'190**	**465'809**	**410'666**	**351'609**	**288'482**	**17'149**
BALANCE																					
ASSETS	**50'254'259**	**49'934'682**	**49'879'639**	**50'110'292**	**50'649'498**	**49'738'629**	**48'813'426**	**47'847'131**	**46'836'951**	**45'779'980**	**44'673'196**	**44'899'832**	**45'550'026**	**46'159'270**	**46'724'225**	**47'241'415**	**47'707'225**	**48'117'891**	**48'469'499**	**48'757'981**	**48'775'130**
Installation	69'200'938	65'574'688	61'948'438	58'322'188	54'695'938	51'069'688	47'443'438	43'817'188	40'190'938	36'564'688	32'938'438	29'312'188	25'685'938	22'059'688	18'433'438	14'807'188	11'180'938	7'554'688	3'928'438	302'188	0
Cash balance	-18'946'678	-15'640'005	-12'068'798	-8'211'895	-4'046'439	-1'331'058	1'369'988	4'029'944	6'646'014	9'215'293	11'734'759	15'587'645	19'864'088	24'099'583	28'290'787	32'434'228	36'526'287	40'563'203	44'541'062	48'455'794	48'775'130
LIABILITIES	**50'254'259**	**49'934'682**	**49'879'639**	**50'110'292**	**50'649'498**	**49'738'629**	**48'813'426**	**47'847'131**	**46'836'951**	**45'779'980**	**44'673'196**	**44'899'832**	**45'550'026**	**46'159'270**	**46'724'225**	**47'241'415**	**47'707'225**	**48'117'891**	**48'469'499**	**48'757'981**	**48'775'130**
Net worth	3'073'791	6'783'918	10'889'543	15'416'088	20'390'802	24'059'595	27'862'894	31'778'777	35'809'445	39'957'150	44'224'194	44'899'832	45'550'026	46'159'270	46'724'225	47'241'415	47'707'225	48'117'891	48'469'499	48'757'981	48'775'130
Debt (Note 3)	47'180'468	43'150'764	38'990'096	34'694'204	30'258'696	25'679'034	20'950'532	16'068'354	11'027'506	5'822'830	449'002	0	0	0	0	0	0	0	0	0	0
Liquidity of the year (This year's cash balance growth minus transferences) (after tax)																					
	2'810'822	3'306'673	3'571'207	3'856'903	4'165'456	2'715'381	2'701'047	2'659'956	2'616'070	2'569'279	2'519'466	3'852'886	4'276'444	4'235'494	4'191'205	4'143'440	4'092'059	4'036'916	3'977'859	3'914'732	319'336

Project:
KOSOVO_Zatric_Windbank_040913

Description:
Financial and economic analysis of the wind park Zatric with 15 Siemens SWT-3.0-113 turbines and a 10-year feed-in tariff of 85 €/MWh. In this scenario, an interest rate of 3.25% is assumed.

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Economy: WINDBANK (Financial & Economic analysis) - Notes regarding Detailed listing of economic figures

Calculation: WP Zatric - Interest Rate 3.25

Amount in € (excl. VAT) when nothing is specified. All expenditures are marked with (-).

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Note 1: Electricity prices																					
Feed-in Tariff (€/kWh)	0.0850	0.0850	0.0850	0.0850	0.0850	0.0850	0.0850	0.0850	0.0850	0.0850	0.0850	0.0540	0.0540	0.0540	0.0540	0.0540	0.0540	0.0540	0.0540	0.0540	0.0540
Note 2: Operation and maintenance																					
Total O&M Costs	0	0	0	0	0	1'714'722	1'936'077	2'003'840	2'073'974	2'146'563	2'221'693	2'299'452	2'379'933	2'463'231	2'549'444	2'638'674	2'731'028	2'826'614	2'925'545	3'027'940	261'160
Note 3: Loan																					
Annuity, 3.3 %/Years, 12.0 Years																					
Debts	47'180'468	43'150'764	38'990'096	34'694'204	30'258'696	25'679'034	20'950'532	16'068'354	11'027'506	5'822'830	449'002	0	0	0	0	0	0	0	0	0	0
Repayment	3'587'033	4'029'705	4'160'670	4'295'892	4'435'509	4'579'663	4'728'502	4'882'178	5'040'849	5'204'676	5'373'828	449'002	0	0	0	0	0	0	0	0	0
Interest rates	1'512'448	1'533'365	1'402'400	1'267'178	1'127'562	983'408	834'569	680'892	522'222	358'394	189'242	14'593	0	0	0	0	0	0	0	0	0
Note 4: Interests on cash balance																					
1.0 % of positive cash balance	0	0	0	0	0	0	194	26'865	53'114	78'912	104'229	135'932	176'377	218'725	260'649	302'115	343'087	383'530	423'404	462'671	40'496
8.0 % of negative cash balance	1'439'698	1'330'257	1'065'723	780'027	471'474	206'827	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxable amount	2'097'500	3'672'750	4'325'475	4'912'928	5'441'635	4'202'749	4'409'647	4'727'312	5'004'062	5'243'670	5'449'517	1'904'637	2'051'747	2'173'281	2'271'417	2'348'100	2'405'069	2'443'874	2'465'893	2'472'355	-8'538'507
Sale of electricity	9'350'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	540'000
Operation and maintenance (100.0 %)	0	0	0	0	0	-1'714'722	-1'936'077	-2'003'840	-2'073'974	-2'146'563	-2'221'693	-2'299'452	-2'379'933	-2'463'231	-2'549'444	-2'638'674	-2'731'028	-2'826'614	-2'925'545	-3'027'940	-261'160
Depreciation 100.0 % of a*b	-7'252'500	-6'527'250	-5'874'525	-5'287'073	-4'758'365	-4'282'529	-3'854'276	-3'468'848	-3'121'963	-2'809'767	-2'528'790	-2'275'911	-2'048'320	-1'843'488	-1'659'139	-1'493'225	-1'343'903	-1'209'513	-1'088'561	-979'705	-881'735
a) Fiscal depreciation balance	65'272'500	58'745'250	52'870'725	47'583'653	42'825'287	38'542'759	34'688'483	31'219'634	28'097'671	25'287'904	22'759'113	20'483'202	18'434'882	16'591'394	14'932'254	13'439'029	12'095'126	10'885'613	9'797'052	8'817'347	7'935'612
b) Depreciation percentage (%)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

Project:
KOSOVO_Zatric_Windbank_040913

Description:
Financial and economic analysis of the wind park Zatric with 15 Siemens SWT-3.0-113 turbines and a 10-year feed-in tariff of 85 €/MWh. In this scenario, an interest rate of 3.25% is assumed.

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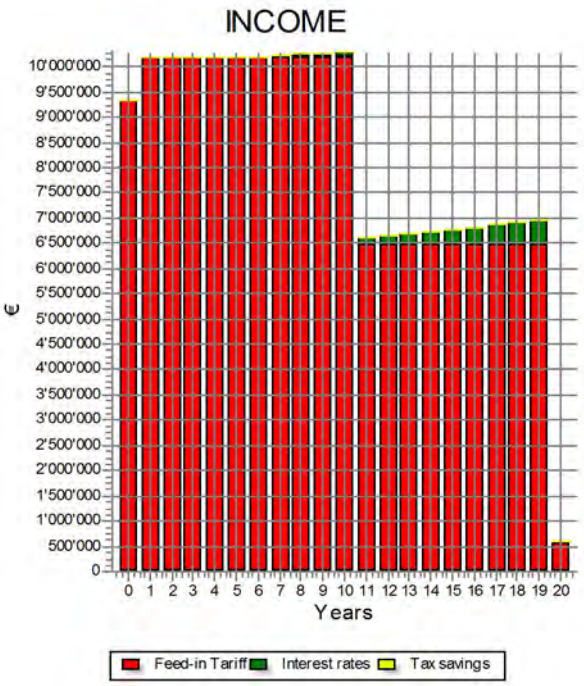
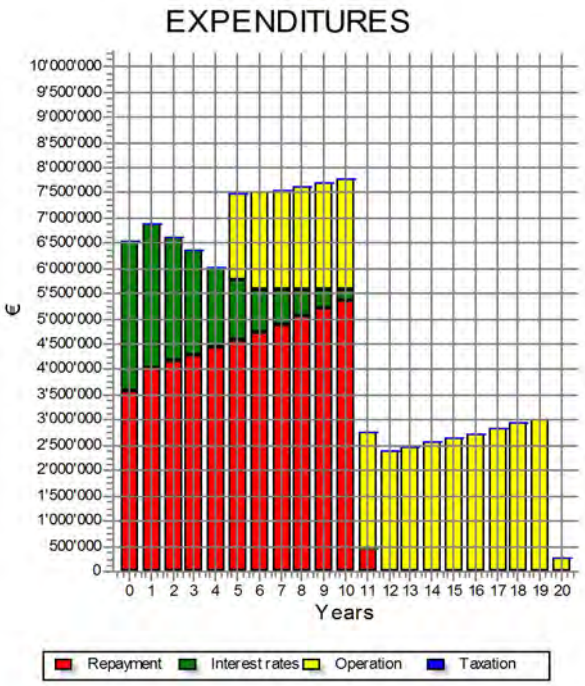
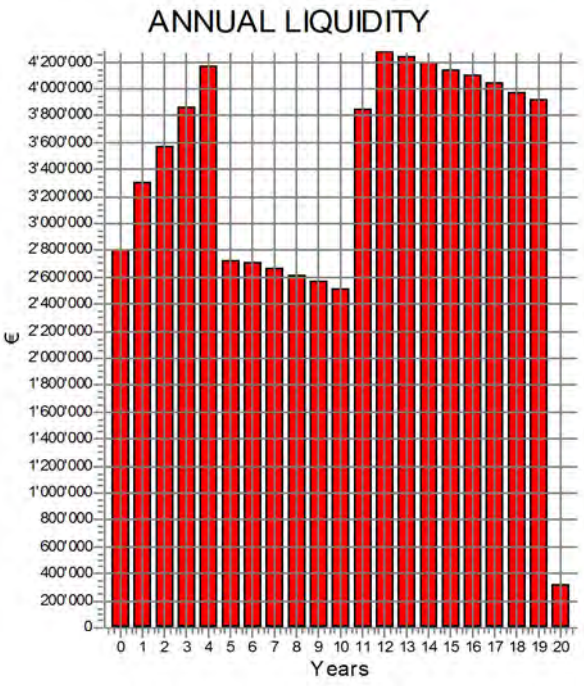
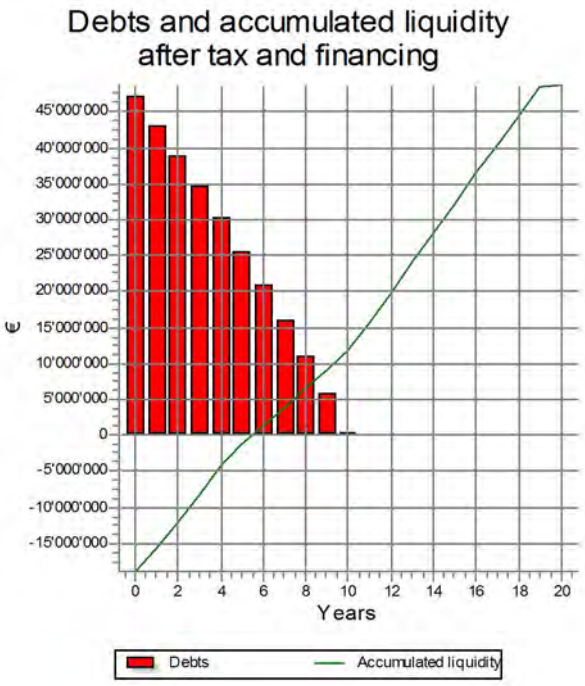
Economy: WINDBANK (Financial & Economic analysis) - Graphs

Calculation: WP Zatric - Interest Rate 3.25









Financial and Economic Analysis - Wind Park Zatric

Calculation Scenario C

Feed-in Tariff

10 years fixed (85 Euro / MWh) and 10 years market based (54 Euro / MWh)

Capital cost (interest rate)

5.5 % / Year

Project:
KOSOVO_Zatric_Windbank_040913

Description:
Financial and economic analysis of the wind park Zatric with 15 Siemens SWT-3.0-113 turbines and a 10-year feed-in tariff of 85 €/MWh. In this scenario, an interest rate of 5.5% is assumed.

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Economy: WINDBANK (Financial & Economic analysis) - Main Result

Calculation: WP Zatric - Interest Rate 5.5

TURN-KEY BUDGET (Amount in € excl. VAT)

		Fixed assets	Operating Costs
Turbines incl. Cold Climate Kit	:	52'000'000	-
Foundation	:	3'500'000	-
Access Roads, Platforms	:	6'000'000	-
Electrical Works	:	2'400'000	-
Project Development	:	8'625'000	-
Total	**:**	**72'525'000**	**0**

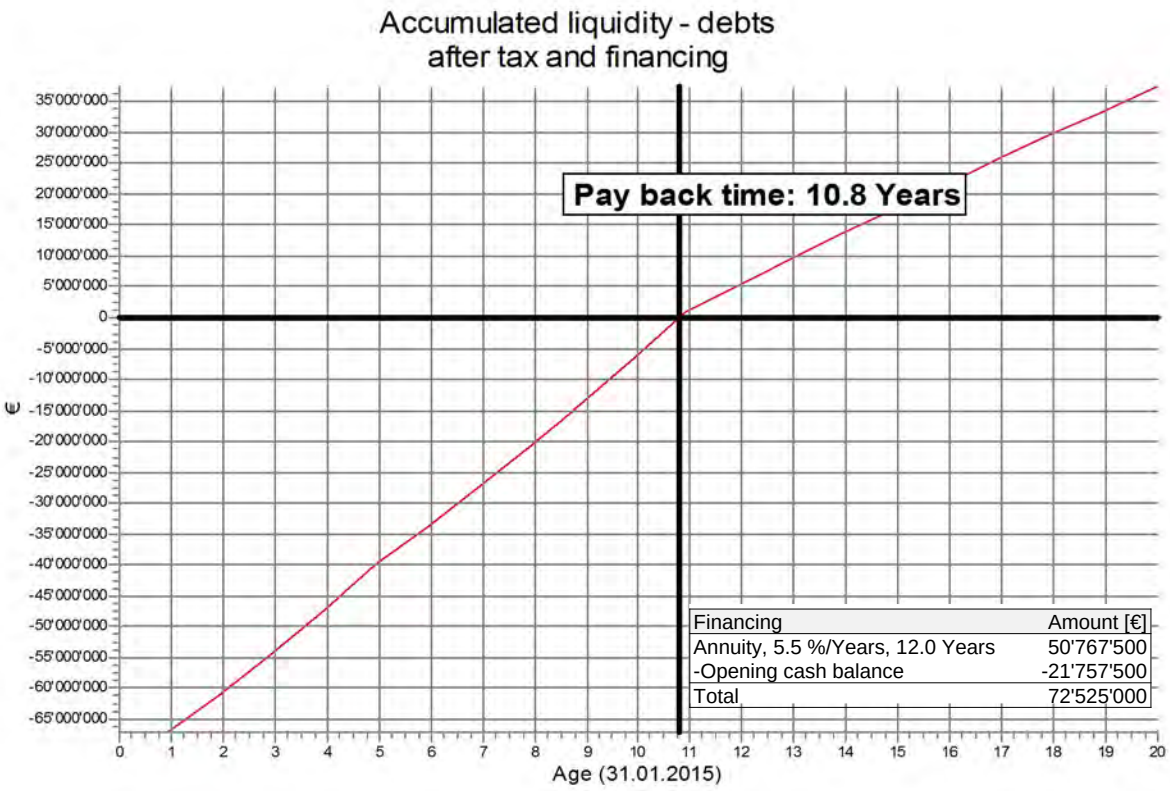
Total Turn-Key Price: **72'525'000** **Cost per 1'000 kWh** **604 €**

Profit and loss account (before financing) (Amount in € excl. VAT)

Income (electricity)			Years: 1		Years: 6		Mean of 20 years Deflated	
Description	Adjustment	MWh/Years	€/kWh	total	€/kWh	total	€/kWh	total
Feed-in Tariff	Annual values	120'000	0.0850	10'200'000	0.0850	10'200'000	0.0539	6'469'945
Total, electricity			0.0850	10'200'000	0.0850	10'200'000	0.0539	6'469'945
-O&M and transferences:			0.0000	0	0.0131	1'575'000	0.0098	1'181'250
Annual profit before tax and financing			0.0850	10'200'000	0.0719	8'625'000	0.0441	5'288'695
Profit in % of investment				14 %		12 %		7 %

Return on investment: 26.0 %
Internal rate of return: 10.7% *)

*)In Windbank all Interest rates are nominal, which approximately are the real interest rate + Inflation. The NPV and IRR are based on nominal interest rates as well.



Project:
KOSOVO_Zatric_Windbank_040913

Description:
Financial and economic analysis of the wind park Zatric with 15 Siemens SWT-3.0-113 turbines and a 10-year feed-in tariff of 85 €/MWh. In this scenario, an interest rate of 5.5% is assumed.

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Economy: WINDBANK (Financial & Economic analysis) - Assumptions and ratios

Calculation: WP Zatric - Interest Rate 5.5

WTG PARK

ENERGY CALCULATION

Calculated Energy prod.	120'000 MWh/Years

VALUE OF ENERGY PRODUCTION

Years	€/kWh	Years	€/kWh	Years	€/kWh
2015	0.0850	2022	0.0850	2029	0.0540
2016	0.0850	2023	0.0850	2030	0.0540
2017	0.0850	2024	0.0850	2031	0.0540
2018	0.0850	2025	0.0850	2032	0.0540
2019	0.0850	2026	0.0540	2033	0.0540
2020	0.0850	2027	0.0540	2034	0.0540
2021	0.0850	2028	0.0540	2035	0.0540

TURN-KEY BUDGET (Amount in € excl. VAT)

D1	Turbines incl. Cold Climate Kit	52'000'000
D1	Foundation	3'500'000
D1	Access Roads, Platforms	6'000'000
D1	Electrical Works	2'400'000
D1	Project Development	8'625'000
	Net installation price	**72'525'000**
	Cost per 1'000 kWh	**604**
	Total entitled depreciation amount	72'525'000
	Total O&M expenditure	0

D) Entry is included in the depreciation amount
I) Entry is included in the calculation of the insurance premium
O) Entry is divided linearly over the period in question

MISCELLANEOUS

Expected month of installation	01.2015
Expected life span	20 Years
Inflation	3.5 %
First regulation of inflation	1. January 2016

INFORMATION ON PURCHASER

Company owned WTG	
Tax on operation and depreciation	0.0 %
Tax on interests	0.0 %
Depreciation: Maximum annual depreciation	10.0 %

FINANCING

Type of loan	Amount [€]	Term [years]	Interest rate [%]
Annuity	50'767'500	12	5.5

Opening cash balance (yields interest)	-21'757'500 [€]
Interests on negative cash balance	8.0 %
Interests on positive cash balance	1.0 %
Tax savings are used to pay off loans	

OPERATION AND TRANSFERENCES

Annual O&M expenditures		Years
Total O&M Costs:	35.00 €/kW inst. capacity	6->

RATIOS

		/kW	/m2	/MWh
Preliminary expenses	€	1'612	-	604
O&M costs	average €/years	26.3	-	9.8
Energy production	kWh/Years	2'667	-	-

Minimum life span for redemption of loan	10.8 Years
Simple pay back time	8.8 Years
Acc. liquidity, deflated	18'865'426 [€]
in % of investment	26.0 %
Net present value (Interest rate=6.0%)	17'808'269 [€]
Internal rate of return	10.7 %
Return on investment	26.0 %
Production price at calculation interest 6.0%	0.0776 €/kWh

Key figures, explanations:
Minimum life span for redemption of loan is the year, where accumulated liquidity (amount on saving account for all liquidity) exceeds the remaining debt.
Simple pay back time is the number of years needed to pay back the investment + operation costs within pay back time. Finance costs, tax and inflation are not included.
Acc. liquidity, deflated, is the total accumulated profit at the end of the project (includes tax etc.), deflated. Same in % of investment is a good indicator of the expected value of the project for the private investor.
Net present value (interest rate
Internal rate of return is the discount rate that results in a net present value of zero for the cash flow. Here is included all payments; investment, O&M, sales of energy etc., but not tax and finance. Should minimum be X as defined above.
Production costs at calculation interest X% is calculated as investment + discounted costs over life time with interest rate X divided with energy production over life time. The calculation interest X is defined as above.

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Economy: WINDBANK (Financial & Economic analysis) - Budgets for liquidity and profit/loss

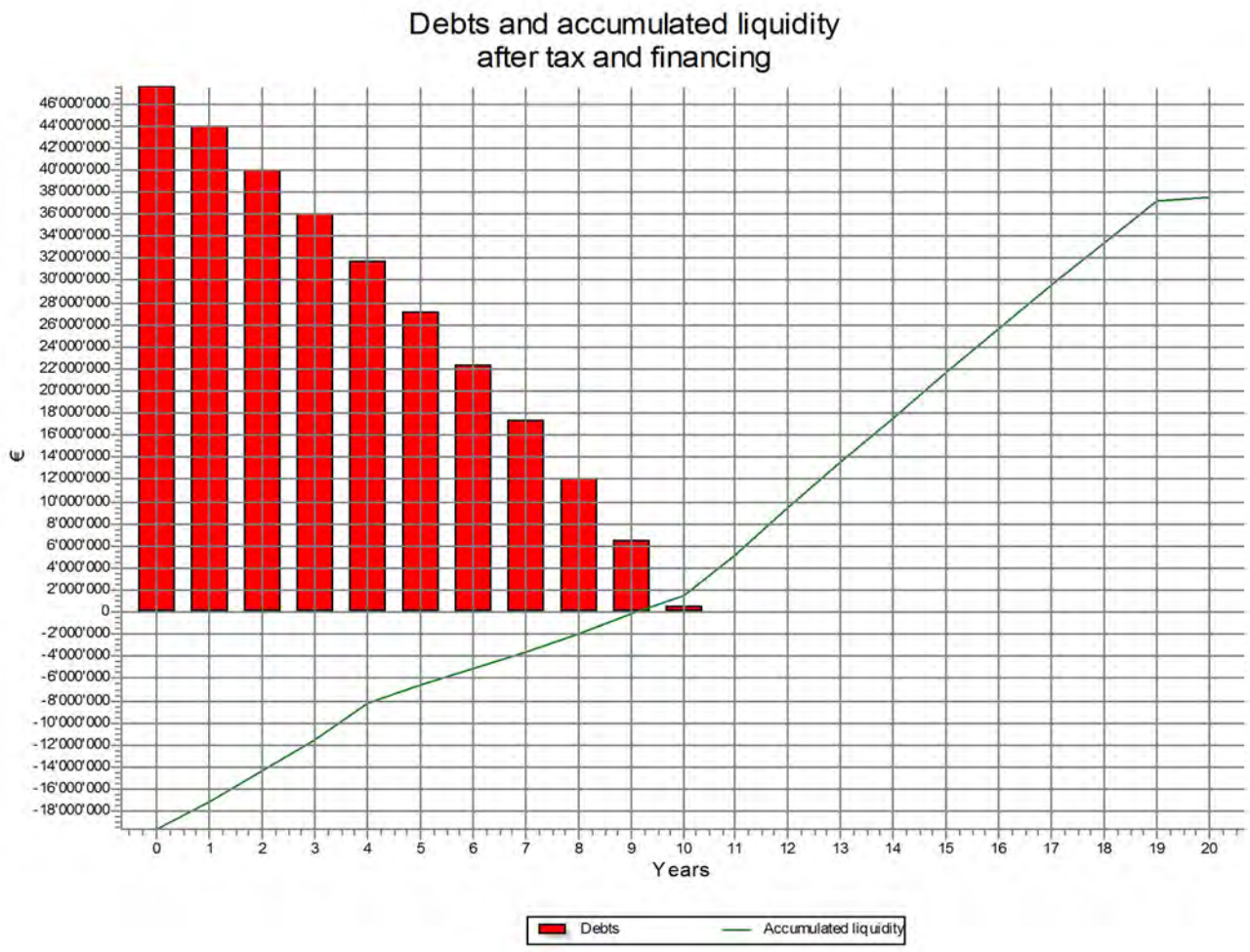
Calculation: WP Zatric - Interest Rate 5.5

CASH FLOW - amount in €

Calendar year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2035
Age	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**20**
INCOME	**9'350'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'206'687**	**6'513'568**	**571'140**
Sale of electricity	9'350'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	6'480'000	540'000
Interests, cash balance	0	0	0	0	0	0	0	0	0	0	6'687	33'567	31'140
EXPENDITURES	**7'214'164**	**7'686'041**	**7'484'924**	**7'267'718**	**7'033'136**	**8'563'097**	**8'662'355**	**8'609'816**	**8'555'541**	**8'499'477**	**8'495'066**	**2'822'239**	**261'160**
Operating Costs	0	0	0	0	0	1'714'722	1'936'077	2'003'840	2'073'974	2'146'563	2'221'693	2'299'452	261'160
Repayment on loans	3'191'064	3'656'669	3'857'786	4'069'964	4'293'812	4'529'972	4'779'120	5'041'972	5'319'280	5'611'841	5'920'492	495'532	0
Interests on loans	2'559'528	2'616'704	2'415'587	2'203'409	1'979'561	1'743'402	1'494'253	1'231'401	954'093	661'533	352'881	27'254	0
Interests on cash balance	1'463'572	1'412'668	1'211'551	994'345	759'763	575'002	452'904	332'603	208'194	79'541	0	0	0
PROFITS	**2'135'836**	**2'513'959**	**2'715'076**	**2'932'282**	**3'166'864**	**1'636'903**	**1'537'646**	**1'590'184**	**1'644'459**	**1'700'523**	**1'711'621**	**3'691'329**	**309'980**
Cash balance	**-19'621'664**	**-17'107'705**	**-14'392'629**	**-11'460'347**	**-8'293'482**	**-6'656'580**	**-5'118'934**	**-3'528'750**	**-1'884'291**	**-183'768**	**1'527'853**	**5'219'182**	**37'538'214**
Debts	**47'576'436**	**43'919'768**	**40'061'984**	**35'992'020**	**31'698'208**	**27'168'236**	**22'389'116**	**17'347'144**	**12'027'864**	**6'416'024**	**495'532**	**0**	**0**

Profit and loss account - amount in €

Calendar year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2035
Age	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**20**
INCOME, Energy prod.	**9'350'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**6'480'000**	**540'000**
EXPENDITURES before interests and depreciations	**0**	**0**	**0**	**0**	**0**	**1'714'722**	**1'936'077**	**2'003'840**	**2'073'974**	**2'146'563**	**2'221'693**	**2'299'452**	**261'160**
Total O&M Costs	0	0	0	0	0	1'714'722	1'936'077	2'003'840	2'073'974	2'146'563	2'221'693	2'299'452	261'160
WORKING PROFITS	**9'350'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**8'485'278**	**8'263'923**	**8'196'160**	**8'126'026**	**8'053'437**	**7'978'307**	**4'180'548**	**278'840**
SIMPLE RETURN ON INVESTMENT (%)	**14**	**14**	**14**	**14**	**14**	**12**	**11**	**11**	**11**	**11**	**11**	**6**	**5**



Project:
KOSOVO_Zatric_Windbank_040913

Description:
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Economy: WINDBANK (Financial & Economic analysis) - Detailed listing of economic figures

Calculation: WP Zatric - Interest Rate 5.5

Assumptions

Amount in € (excl. VAT) when nothing is specified. All expenditures are marked with (-).

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Operation																					
INCOME																					
Sale of electricity, 120'000 MWh/Year (Note 1)	9'350'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	540'000
EXPENDITURES	**-3'324'063**	**-3'626'250**	**-3'626'250**	**-3'626'250**	**-3'626'250**	**-5'340'972**	**-5'562'327**	**-5'630'090**	**-5'700'224**	**-5'772'813**	**-5'847'943**	**-5'925'702**	**-6'006'183**	**-6'089'481**	**-6'175'694**	**-6'264'924**	**-6'357'278**	**-6'452'864**	**-6'551'795**	**-6'654'190**	**-563'347**
Operation and maintenance (Note 2)	0	0	0	0	0	-1'714'722	-1'936'077	-2'003'840	-2'073'974	-2'146'563	-2'221'693	-2'299'452	-2'379'933	-2'463'231	-2'549'444	-2'638'674	-2'731'028	-2'826'614	-2'925'545	-3'027'940	-261'160
Depreciation (Straight-line over 20 years)	-3'324'063	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-3'626'250	-302'188
WORKING PROFITS, ORDINARY	**6'025'938**	**6'573'750**	**6'573'750**	**6'573'750**	**6'573'750**	**4'859'028**	**4'637'673**	**4'569'910**	**4'499'776**	**4'427'187**	**4'352'057**	**554'298**	**473'817**	**390'519**	**304'306**	**215'076**	**122'722**	**27'136**	**-71'795**	**-174'189**	**-23'347**
FINANCING	**-4'023'100**	**-4'029'372**	**-3'627'139**	**-3'197'754**	**-2'739'324**	**-2'318'404**	**-1'947'157**	**-1'564'005**	**-1'162'287**	**-741'073**	**-346'194**	**6'313**	**72'692**	**114'003**	**154'880**	**195'288**	**235'193**	**274'556**	**313'341**	**351'507**	**31'140**
Interests, loans (Note 3)	-2'559'528	-2'616'704	-2'415'587	-2'203'409	-1'979'561	-1'743'402	-1'494'253	-1'231'401	-954'093	-661'533	-352'881	-27'254	0	0	0	0	0	0	0	0	0
Interests, cash balance (Note 4)	-1'463'572	-1'412'668	-1'211'551	-994'345	-759'763	-575'002	-452'904	-332'603	-208'194	-79'541	6'687	33'567	72'692	114'003	154'880	195'288	235'193	274'556	313'341	351'507	31'140
Working profits	**2'002'838**	**2'544'378**	**2'946'612**	**3'375'996**	**3'834'426**	**2'540'624**	**2'690'516**	**3'005'906**	**3'337'489**	**3'686'114**	**4'005'863**	**560'611**	**546'509**	**504'523**	**459'186**	**410'364**	**357'915**	**301'692**	**241'546**	**177'318**	**7'792**
BALANCE																					
ASSETS	**49'579'274**	**48'466'983**	**47'555'809**	**46'861'841**	**46'402'455**	**44'413'108**	**42'324'503**	**40'288'437**	**38'306'646**	**36'380'919**	**34'466'291**	**34'531'370**	**35'077'879**	**35'582'402**	**36'041'588**	**36'451'952**	**36'809'866**	**37'111'559**	**37'353'104**	**37'530'422**	**37'538'214**
Installation	69'200'938	65'574'688	61'948'438	58'322'188	54'695'938	51'069'688	47'443'438	43'817'188	40'190'938	36'564'688	32'938'438	29'312'188	25'685'938	22'059'688	18'433'438	14'807'188	11'180'938	7'554'688	3'928'438	302'188	0
Cash balance	-19'621'664	-17'107'705	-14'392'629	-11'460'347	-8'293'482	-6'656'580	-5'118'934	-3'528'750	-1'884'291	-183'768	1'527'853	5'219'182	9'391'941	13'522'714	17'608'150	21'644'764	25'628'929	29'556'871	33'424'667	37'228'234	37'538'214
LIABILITIES	**49'579'274**	**48'466'983**	**47'555'809**	**46'861'841**	**46'402'455**	**44'413'108**	**42'324'503**	**40'288'437**	**38'306'646**	**36'380'919**	**34'466'291**	**34'531'370**	**35'077'879**	**35'582'402**	**36'041'588**	**36'451'952**	**36'809'866**	**37'111'559**	**37'353'104**	**37'530'422**	**37'538'214**
Net worth	2'002'838	4'547'215	7'493'825	10'869'821	14'704'247	17'244'872	19'935'387	22'941'293	26'278'782	29'964'896	33'970'759	34'531'370	35'077'879	35'582'402	36'041'588	36'451'952	36'809'866	37'111'559	37'353'104	37'530'422	37'538'214
Debt (Note 3)	47'576'436	43'919'768	40'061'984	35'992'020	31'698'208	27'168'236	22'389'116	17'347'144	12'027'864	6'416'024	495'532	0	0	0	0	0	0	0	0	0	0
Liquidity of the year (This year's cash balance growth minus transferences) (after tax)																					
	2'135'836	2'513'959	2'715'076	2'932'282	3'166'864	1'636'903	1'537'646	1'590'184	1'644'459	1'700'523	1'711'621	3'691'329	4'172'759	4'130'773	4'085'436	4'036'614	3'984'165	3'927'942	3'867'796	3'803'568	309'980

Project:
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Description:
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Economy: WINDBANK (Financial & Economic analysis) - Notes regarding Detailed listing of economic figures

Calculation: WP Zatric - Interest Rate 5.5

Amount in € (excl. VAT) when nothing is specified. All expenditures are marked with (-).

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Note 1: Electricity prices																					
Feed-in Tariff (€/kWh)	0.0850	0.0850	0.0850	0.0850	0.0850	0.0850	0.0850	0.0850	0.0850	0.0850	0.0850	0.0540	0.0540	0.0540	0.0540	0.0540	0.0540	0.0540	0.0540	0.0540	0.0540
Note 2: Operation and maintenance																					
Total O&M Costs	0	0	0	0	0	1'714'722	1'936'077	2'003'840	2'073'974	2'146'563	2'221'693	2'299'452	2'379'933	2'463'231	2'549'444	2'638'674	2'731'028	2'826'614	2'925'545	3'027'940	261'160
Note 3: Loan																					
Annuity, 5.5 %/Years, 12.0 Years																					
Debts	47'576'436	43'919'768	40'061'984	35'992'020	31'698'208	27'168'236	22'389'116	17'347'144	12'027'864	6'416'024	495'532	0	0	0	0	0	0	0	0	0	0
Repayment	3'191'064	3'656'669	3'857'786	4'069'964	4'293'812	4'529'972	4'779'120	5'041'972	5'319'280	5'611'841	5'920'492	495'532	0	0	0	0	0	0	0	0	0
Interest rates	2'559'528	2'616'704	2'415'587	2'203'409	1'979'561	1'743'402	1'494'253	1'231'401	954'093	661'533	352'881	27'254	0	0	0	0	0	0	0	0	0
Note 4: Interests on cash balance																					
1.0 % of positive cash balance	0	0	0	0	0	0	0	0	0	0	6'687	33'567	72'692	114'003	154'880	195'288	235'193	274'556	313'341	351'507	31'140
8.0 % of negative cash balance	1'463'572	1'412'668	1'211'551	994'345	759'763	575'002	452'904	332'603	208'194	79'541	0	0	0	0	0	0	0	0	0	0	0
Taxable amount	2'097'500	3'672'750	4'325'475	4'912'928	5'441'635	4'202'749	4'409'647	4'727'312	5'004'062	5'243'670	5'449'517	1'904'637	2'051'747	2'173'281	2'271'417	2'348'100	2'405'069	2'443'874	2'465'893	2'472'355	-8'538'507
Sale of electricity	9'350'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	540'000
Operation and maintenance (100.0 %)	0	0	0	0	0	-1'714'722	-1'936'077	-2'003'840	-2'073'974	-2'146'563	-2'221'693	-2'299'452	-2'379'933	-2'463'231	-2'549'444	-2'638'674	-2'731'028	-2'826'614	-2'925'545	-3'027'940	-261'160
Depreciation 100.0 % of a*b	-7'252'500	-6'527'250	-5'874'525	-5'287'073	-4'758'365	-4'282'529	-3'854'276	-3'468'848	-3'121'963	-2'809'767	-2'528'790	-2'275'911	-2'048'320	-1'843'488	-1'659'139	-1'493'225	-1'343'903	-1'209'513	-1'088'561	-979'705	-881'735
a) Fiscal depreciation balance	65'272'500	58'745'250	52'870'725	47'583'653	42'825'287	38'542'759	34'688'483	31'219'634	28'097'671	25'287'904	22'759'113	20'483'202	18'434'882	16'591'394	14'932'254	13'439'029	12'095'126	10'885'613	9'797'052	8'817'347	7'935'612
b) Depreciation percentage (%)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

Project:
KOSOVO_Zatric_Windbank_040913

Description:
Financial and economic analysis of the wind park Zatric with 15 Siemens SWT-3.0-113 turbines and a 10-year feed-in tariff of 85 €/MWh. In this scenario, an interest rate of 5.5% is assumed.

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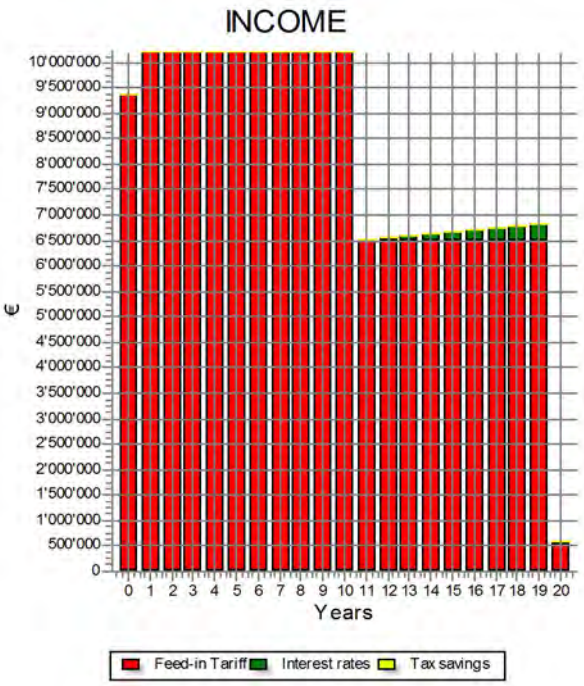
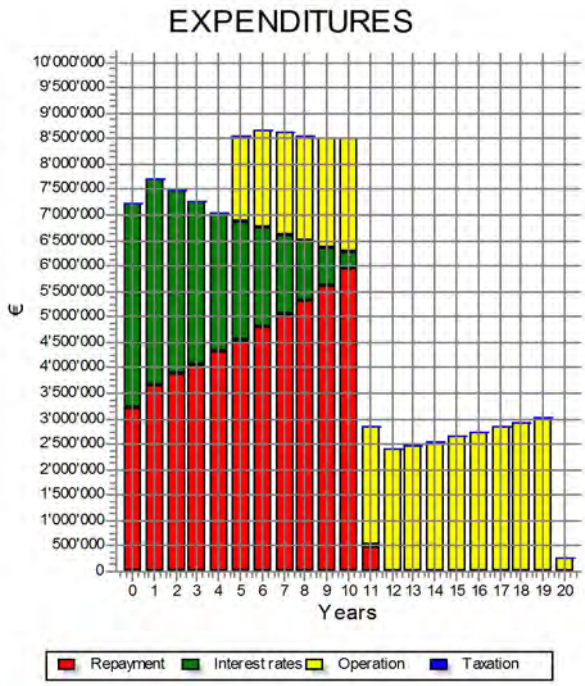
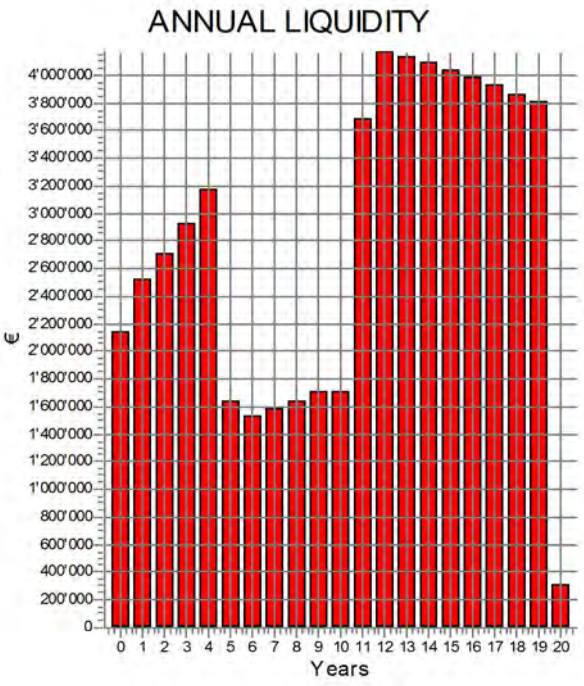
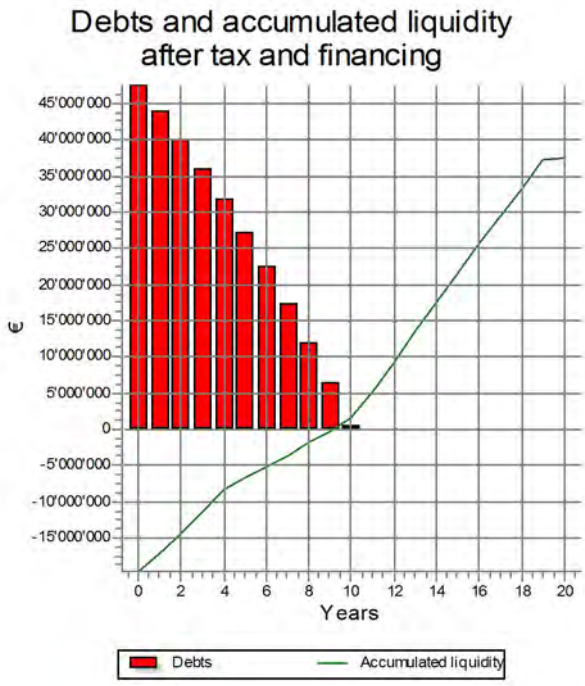
Economy: WINDBANK (Financial & Economic analysis) - Graphs

Calculation: WP Zatric - Interest Rate 5.5









Financial and Economic Analysis - Wind Park Zatric

Calculation Scenario D

Feed-in Tariff

10 years fixed (85 Euro / MWh) and 10 years market based (54 Euro / MWh)

Capital cost (interest rate)

4.0 % / Year

Subsidies

EU Grant: 12.5 Mio. Euros

Project:
KOSOVO_Zatric_Windbank_040913

Description:
Financial and economic analysis of the wind park Zatric with 15 Siemens SWT-3.0-113 turbines and a 10-year feed-in tariff of 85 €/MWh. In this scenario, an EU Grant of 12.5 Mio € and an interest rate of 4% is assumed.

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Economy: WINDBANK (Financial & Economic analysis) - Main Result

Calculation: WP Zatric - Euro Grant 12.5 Mio, Interest Rate 4

TURN-KEY BUDGET (Amount in € excl. VAT)

		Fixed assets	Operating Costs
Turbines incl. Cold Climate Kit	:	52'000'000	-
Foundation	:	3'500'000	-
Access Roads, Platforms	:	6'000'000	-
Electrical Works	:	2'400'000	-
Project Development	:	8'625'000	-
EU Grant	:	-12'500'000	-
Total	**:**	**60'025'000**	**0**

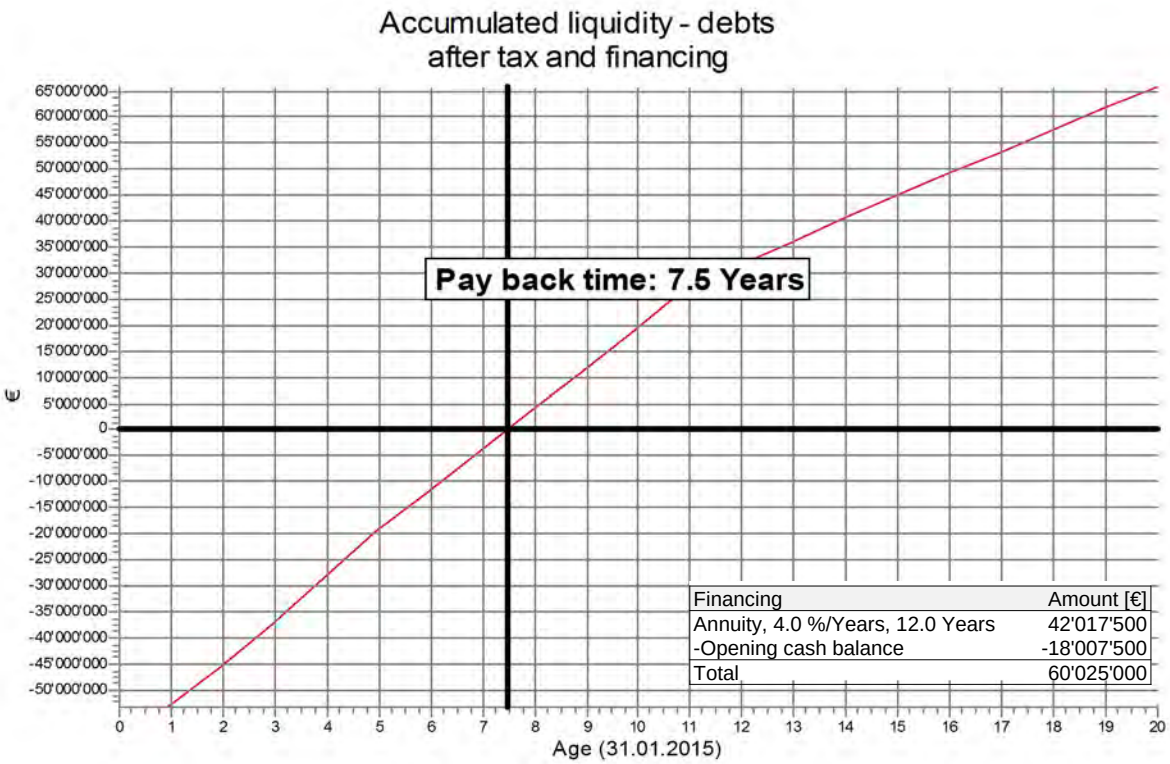
Total Turn-Key Price: **60'025'000** **Cost per 1'000 kWh** **500 €**

Profit and loss account (before financing) (Amount in € excl. VAT)

Income (electricity)			Years: 1		Years: 6		Mean of 20 years Deflated	
Description	Adjustment	MWh/Years	€/kWh	total	€/kWh	total	€/kWh	total
Feed-in Tariff	Annual values	120'000	0.0850	10'200'000	0.0850	10'200'000	0.0539	6'469'945
Total, electricity			0.0850	10'200'000	0.0850	10'200'000	0.0539	6'469'945
-O&M and transferences:			0.0000	0	0.0131	1'575'000	0.0098	1'181'250
Annual profit before tax and financing			0.0850	10'200'000	0.0719	8'625'000	0.0441	5'288'695
Profit in % of investment				17 %		14 %		9 %

Return on investment: 55.2 %
Internal rate of return: 15.4% *)

*)In Windbank all Interest rates are nominal, which approximately are the real interest rate + Inflation. The NPV and IRR are based on nominal interest rates as well.



Project:
KOSOVO_Zatric_Windbank_040913

Description:
Financial and economic analysis of the wind park Zatric with 15 Siemens SWT-3.0-113 turbines and a 10-year feed-in tariff of 85 €/MWh. In this scenario, an EU Grant of 12.5 Mio € and an interest rate of 4% is assumed.

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Economy: WINDBANK (Financial & Economic analysis) - Assumptions and ratios

Calculation: WP Zatric - Euro Grant 12.5 Mio, Interest Rate 4

WTG PARK

ENERGY CALCULATION

Calculated Energy prod.	120'000 MWh/Years

VALUE OF ENERGY PRODUCTION

Years	€/kWh	Years	€/kWh	Years	€/kWh
2015	0.0850	2022	0.0850	2029	0.0540
2016	0.0850	2023	0.0850	2030	0.0540
2017	0.0850	2024	0.0850	2031	0.0540
2018	0.0850	2025	0.0850	2032	0.0540
2019	0.0850	2026	0.0540	2033	0.0540
2020	0.0850	2027	0.0540	2034	0.0540
2021	0.0850	2028	0.0540	2035	0.0540

TURN-KEY BUDGET (Amount in € excl. VAT)

D1	Turbines incl. Cold Climate Kit	52'000'000
D1	Foundation	3'500'000
D1	Access Roads, Platforms	6'000'000
D1	Electrical Works	2'400'000
D1	Project Development	8'625'000
D1	EU Grant	-12'500'000
	Net installation price	**60'025'000**
	Cost per 1'000 kWh	**500**
	Total entitled depreciation amount	60'025'000
	Total O&M expenditure	0

D) Entry is included in the depreciation amount
I) Entry is included in the calculation of the insurance premium
O) Entry is divided linearly over the period in question

MISCELLANEOUS

Expected month of installation	01.2015
Expected life span	20 Years
Inflation	3.5 %
First regulation of inflation	1. January 2016

INFORMATION ON PURCHASER

Company owned WTG	
Tax on operation and depreciation	0.0 %
Tax on interests	0.0 %
Depreciation: Maximum annual depreciation	10.0 %

FINANCING

Type of loan	Amount [€]	Term [years]	Interest rate [%]
Annuity	42'017'500	12	4.0

Opening cash balance (yields interest)	-18'007'500 [€]
Interests on negative cash balance	8.0 %
Interests on positive cash balance	1.0 %
Tax savings are used to pay off loans	

OPERATION AND TRANSFERENCES

Annual O&M expenditures		Years
Total O&M Costs:	35.00 €/kW inst. capacity	6->

RATIOS

		/kW	/m2	/MWh
Preliminary expenses	€	1'334	-	500
O&M costs	average €/years	26.3	-	9.8
Energy production	kWh/Years	2'667	-	-

Minimum life span for redemption of loan	7.5 Years
Simple pay back time	6.8 Years
Acc. liquidity, deflated	33'124'925 [€]
in % of investment	55.2 %
Net present value (Interest rate=6.0%)	29'600'722 [€]
Internal rate of return	15.4 %
Return on investment	55.2 %
Production price at calculation interest 6.0%	0.0661 €/kWh

Key figures, explanations:
Minimum life span for redemption of loan is the year, where accumulated liquidity (amount on saving account for all liquidity) exceeds the remaining debt.
Simple pay back time is the number of years needed to pay back the investment + operation costs within pay back time. Finance costs, tax and inflation are not included.
Acc. liquidity, deflated, is the total accumulated profit at the end of the project (includes tax etc.), deflated. Same in % of investment is a good indicator of the expected value of the project for the private investor.
Net present value (interest rate
Internal rate of return is the discount rate that results in a net present value of zero for the cash flow. Here is included all payments; investment, O&M, sales of energy etc., but not tax and finance. Should minimum be X as defined above.
Production costs at calculation interest X% is calculated as investment + discounted costs over life time with interest rate X divided with energy production over life time. The calculation interest X is defined as above.

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Economy: WINDBANK (Financial & Economic analysis) - Budgets for liquidity and profit/loss

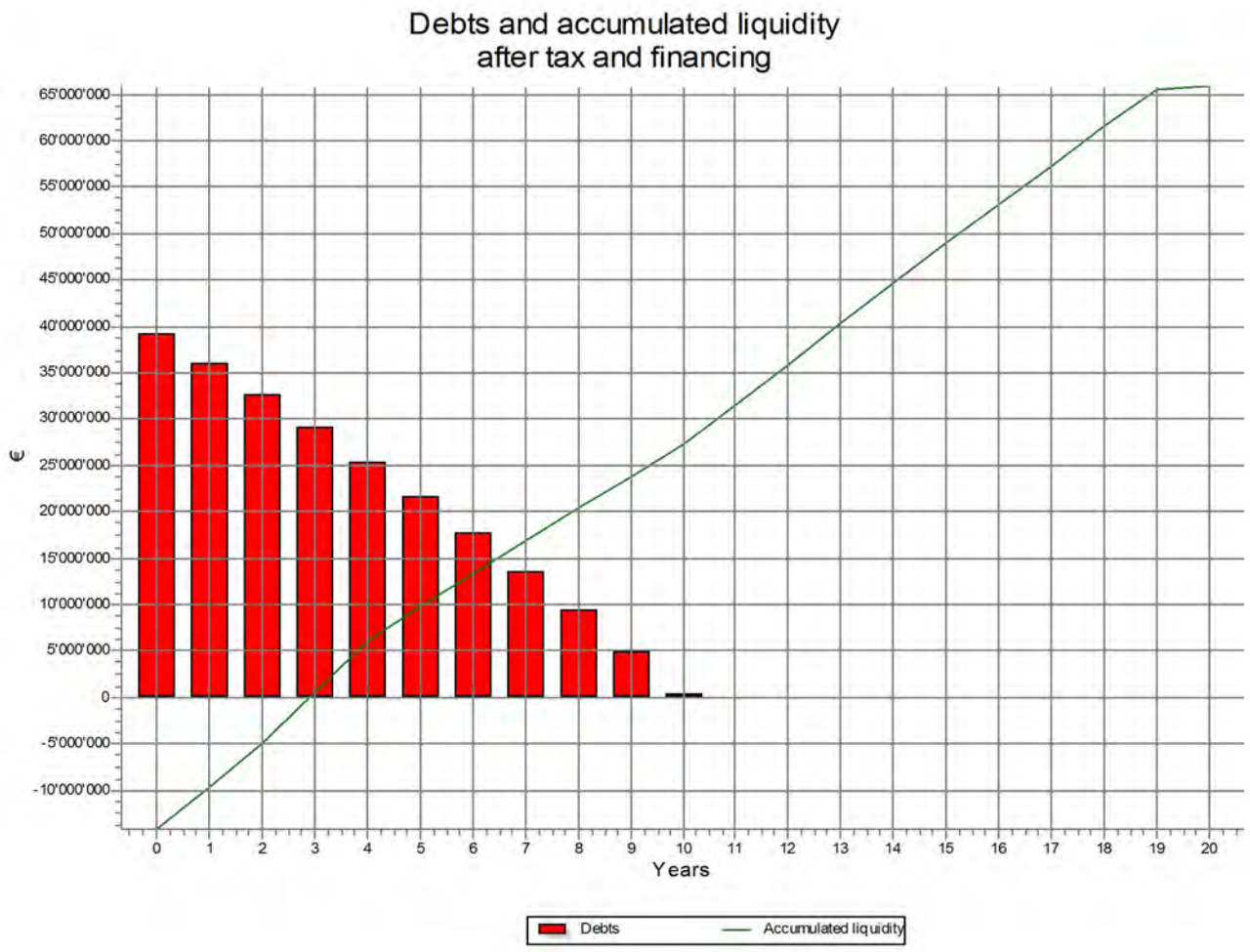
Calculation: WP Zatric - Euro Grant 12.5 Mio, Interest Rate 4

CASH FLOW - amount in €

Calendar year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2035
Age	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**20**
INCOME	**9'350'000**	**10'200'000**	**10'200'000**	**10'221'635**	**10'232'619**	**10'278'409**	**10'314'977**	**10'350'464**	**10'385'617**	**10'420'408**	**10'454'809**	**6'772'171**	**594'765**
Sale of electricity	9'350'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	6'480'000	540'000
Interests, cash balance	0	0	0	21'635	32'619	78'409	114'977	150'464	185'617	220'408	254'808	292'171	54'765
EXPENDITURES	**5'535'493**	**5'715'547**	**5'356'791**	**4'796'258**	**4'796'258**	**6'510'980**	**6'732'335**	**6'800'097**	**6'870'232**	**6'942'821**	**7'017'951**	**2'699'133**	**261'160**
Operating Costs	0	0	0	0	0	1'714'722	1'936'077	2'003'840	2'073'974	2'146'563	2'221'693	2'299'452	261'160
Repayment on loans	2'855'928	3'229'795	3'358'987	3'493'346	3'633'080	3'778'403	3'929'539	4'086'721	4'250'190	4'420'197	4'597'005	384'308	0
Interests on loans	1'540'642	1'566'463	1'437'271	1'302'912	1'163'178	1'017'855	866'718	709'537	546'068	376'060	199'253	15'372	0
Interests on cash balance	1'138'924	919'290	560'534	0	0	0	0	0	0	0	0	0	0
PROFITS	**3'814'507**	**4'484'453**	**4'843'209**	**5'425'377**	**5'436'362**	**3'767'430**	**3'582'642**	**3'550'367**	**3'515'386**	**3'477'588**	**3'436'858**	**4'073'039**	**333'605**
Cash balance	**-14'192'993**	**-9'708'540**	**-4'865'331**	**560'046**	**5'996'408**	**9'763'837**	**13'346'480**	**16'896'847**	**20'412'232**	**23'889'820**	**27'326'678**	**31'399'717**	**65'911'606**
Debts	**39'161'572**	**35'931'776**	**32'572'790**	**29'079'444**	**25'446'364**	**21'667'960**	**17'738'420**	**13'651'699**	**9'401'510**	**4'981'313**	**384'308**	**0**	**0**

Profit and loss account - amount in €

Calendar year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2035
Age	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**20**
INCOME, Energy prod.	**9'350'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**6'480'000**	**540'000**
EXPENDITURES before interests and depreciations	**0**	**0**	**0**	**0**	**0**	**1'714'722**	**1'936'077**	**2'003'840**	**2'073'974**	**2'146'563**	**2'221'693**	**2'299'452**	**261'160**
Total O&M Costs	0	0	0	0	0	1'714'722	1'936'077	2'003'840	2'073'974	2'146'563	2'221'693	2'299'452	261'160
WORKING PROFITS	**9'350'000**	**10'200'000**	**10'200'000**	**10'200'000**	**10'200'000**	**8'485'278**	**8'263'923**	**8'196'160**	**8'126'026**	**8'053'437**	**7'978'307**	**4'180'548**	**278'840**
SIMPLE RETURN ON INVESTMENT (%)	**17**	**17**	**17**	**17**	**17**	**14**	**14**	**14**	**14**	**13**	**13**	**7**	**6**



Project:
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Economy: WINDBANK (Financial & Economic analysis) - Detailed listing of economic figures

Calculation: WP Zatric - Euro Grant 12.5 Mio, Interest Rate 4

Assumptions

Amount in € (excl. VAT) when nothing is specified. All expenditures are marked with (-).

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Operation																					
INCOME																					
Sale of electricity, 120'000 MWh/Year (Note 1)	9'350'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	540'000
EXPENDITURES	**-2'751'146**	**-3'001'250**	**-3'001'250**	**-3'001'250**	**-3'001'250**	**-4'715'972**	**-4'937'327**	**-5'005'090**	**-5'075'224**	**-5'147'813**	**-5'222'943**	**-5'300'702**	**-5'381'183**	**-5'464'481**	**-5'550'694**	**-5'639'924**	**-5'732'278**	**-5'827'864**	**-5'926'795**	**-6'029'190**	**-511'264**
Operation and maintenance (Note 2)	0	0	0	0	0	-1'714'722	-1'936'077	-2'003'840	-2'073'974	-2'146'563	-2'221'693	-2'299'452	-2'379'933	-2'463'231	-2'549'444	-2'638'674	-2'731'028	-2'826'614	-2'925'545	-3'027'940	-261'160
Depreciation (Straight-line over 20 years)	-2'751'146	-3'001'250	-3'001'250	-3'001'250	-3'001'250	-3'001'250	-3'001'250	-3'001'250	-3'001'250	-3'001'250	-3'001'250	-3'001'250	-3'001'250	-3'001'250	-3'001'250	-3'001'250	-3'001'250	-3'001'250	-3'001'250	-3'001'250	-250'104
WORKING PROFITS, ORDINARY	**6'598'854**	**7'198'750**	**7'198'750**	**7'198'750**	**7'198'750**	**5'484'028**	**5'262'673**	**5'194'910**	**5'124'776**	**5'052'187**	**4'977'057**	**1'179'298**	**1'098'817**	**1'015'519**	**929'306**	**840'076**	**747'722**	**652'136**	**553'205**	**450'811**	**28'736**
FINANCING	**-2'679'566**	**-2'485'753**	**-1'997'805**	**-1'281'277**	**-1'130'559**	**-939'445**	**-751'742**	**-559'073**	**-360'451**	**-155'652**	**55'556**	**276'799**	**334'498**	**378'427**	**421'948**	**465'026**	**507'628**	**549'716**	**591'253**	**632'198**	**54'765**
Interests, loans (Note 3)	-1'540'642	-1'566'463	-1'437'271	-1'302'912	-1'163'178	-1'017'855	-866'718	-709'537	-546'068	-376'060	-199'253	-15'372	0	0	0	0	0	0	0	0	0
Interests, cash balance (Note 4)	-1'138'924	-919'290	-560'534	21'635	32'619	78'409	114'977	150'464	185'617	220'408	254'808	292'171	334'498	378'427	421'948	465'026	507'628	549'716	591'253	632'198	54'765
Working profits	**3'919'288**	**4'712'997**	**5'200'946**	**5'917'473**	**6'068'192**	**4'544'583**	**4'510'931**	**4'635'838**	**4'764'325**	**4'896'535**	**5'032'613**	**1'456'097**	**1'433'315**	**1'393'946**	**1'351'254**	**1'305'102**	**1'255'350**	**1'201'852**	**1'144'457**	**1'083'008**	**83'501**
BALANCE																					
ASSETS	**43'080'861**	**44'564'064**	**46'406'023**	**48'830'150**	**51'265'262**	**52'031'441**	**52'612'834**	**53'161'951**	**53'676'087**	**54'152'424**	**54'588'032**	**55'659'821**	**57'093'135**	**58'487'081**	**59'838'335**	**61'143'437**	**62'398'788**	**63'600'640**	**64'745'098**	**65'828'106**	**65'911'606**
Installation	57'273'854	54'272'604	51'271'354	48'270'104	45'268'854	42'267'604	39'266'354	36'265'104	33'263'854	30'262'604	27'261'354	24'260'104	21'258'854	18'257'604	15'256'354	12'255'104	9'253'854	6'252'604	3'251'354	250'104	0
Cash balance	-14'192'993	-9'708'540	-4'865'331	560'046	5'996'408	9'763'837	13'346'480	16'896'847	20'412'232	23'889'820	27'326'678	31'399'717	35'834'281	40'229'477	44'581'981	48'888'333	53'144'934	57'348'036	61'493'743	65'578'002	65'911'606
LIABILITIES	**43'080'861**	**44'564'064**	**46'406'023**	**48'830'150**	**51'265'262**	**52'031'441**	**52'612'834**	**53'161'951**	**53'676'087**	**54'152'424**	**54'588'032**	**55'659'821**	**57'093'135**	**58'487'081**	**59'838'335**	**61'143'437**	**62'398'788**	**63'600'640**	**64'745'098**	**65'828'106**	**65'911'606**
Net worth	3'919'289	8'632'288	13'833'233	19'750'706	25'818'898	30'363'481	34'874'414	39'510'252	44'274'577	49'171'111	54'203'724	55'659'821	57'093'135	58'487'081	59'838'335	61'143'437	62'398'788	63'600'640	64'745'098	65'828'106	65'911'606
Debt (Note 3)	39'161'572	35'931'776	32'572'790	29'079'444	25'446'364	21'667'960	17'738'420	13'651'699	9'401'510	4'981'313	384'308	0	0	0	0	0	0	0	0	0	0
Liquidity of the year (This year's cash balance growth minus transferences) (after tax)	3'814'507	4'484'453	4'843'209	5'425'377	5'436'362	3'767'430	3'582'642	3'550'367	3'515'386	3'477'588	3'436'858	4'073'039	4'434'565	4'395'196	4'352'504	4'306'352	4'256'600	4'203'102	4'145'707	4'084'258	333'605

Project:
KOSOVO_Zatric_Windbank_040913

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Economy: WINDBANK (Financial & Economic analysis) - Notes regarding Detailed listing of economic figures

Calculation: WP Zatric - Euro Grant 12.5 Mio, Interest Rate 4

Amount in € (excl. VAT) when nothing is specified. All expenditures are marked with (-).

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Note 1: Electricity prices																					
Feed-in Tariff (€/kWh)	0.0850	0.0850	0.0850	0.0850	0.0850	0.0850	0.0850	0.0850	0.0850	0.0850	0.0850	0.0540	0.0540	0.0540	0.0540	0.0540	0.0540	0.0540	0.0540	0.0540	0.0540
Note 2: Operation and maintenance																					
Total O&M Costs	0	0	0	0	0	1'714'722	1'936'077	2'003'840	2'073'974	2'146'563	2'221'693	2'299'452	2'379'933	2'463'231	2'549'444	2'638'674	2'731'028	2'826'614	2'925'545	3'027'940	261'160
Note 3: Loan																					
Annuity, 4.0 %/Years, 12.0 Years																					
Debts	39'161'572	35'931'776	32'572'790	29'079'444	25'446'364	21'667'960	17'738'420	13'651'699	9'401'510	4'981'313	384'308	0	0	0	0	0	0	0	0	0	0
Repayment	2'855'928	3'229'795	3'358'987	3'493'346	3'633'080	3'778'403	3'929'539	4'086'721	4'250'190	4'420'197	4'597'005	384'308	0	0	0	0	0	0	0	0	0
Interest rates	1'540'642	1'566'463	1'437'271	1'302'912	1'163'178	1'017'855	866'718	709'537	546'068	376'060	199'253	15'372	0	0	0	0	0	0	0	0	0
Note 4: Interests on cash balance																					
1.0 % of positive cash balance	0	0	0	21'635	32'619	78'409	114'977	150'464	185'617	220'408	254'808	292'171	334'498	378'427	421'948	465'026	507'628	549'716	591'253	632'198	54'765
8.0 % of negative cash balance	1'138'924	919'290	560'534	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxable amount	3'347'500	4'797'750	5'337'975	5'824'178	6'261'760	4'940'862	5'073'948	5'325'183	5'542'146	5'727'945	5'885'365	2'296'900	2'404'784	2'491'014	2'557'377	2'605'464	2'636'697	2'652'338	2'653'512	2'641'212	-7'018'798
Sale of electricity	9'350'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	10'200'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	6'480'000	540'000
Operation and maintenance (100.0 %)	0	0	0	0	0	-1'714'722	-1'936'077	-2'003'840	-2'073'974	-2'146'563	-2'221'693	-2'299'452	-2'379'933	-2'463'231	-2'549'444	-2'638'674	-2'731'028	-2'826'614	-2'925'545	-3'027'940	-261'160
Depreciation 100.0 % of a*b	-6'002'500	-5'402'250	-4'862'025	-4'375'823	-3'938'240	-3'544'416	-3'189'975	-2'870'977	-2'583'879	-2'325'491	-2'092'942	-1'883'648	-1'695'283	-1'525'755	-1'373'179	-1'235'862	-1'112'275	-1'001'048	-900'943	-810'849	-729'764
a) Fiscal depreciation balance	54'022'500	48'620'250	43'758'225	39'382'403	35'444'162	31'899'746	28'709'771	25'838'794	23'254'915	20'929'423	18'836'481	16'952'833	15'257'550	13'731'795	12'358'615	11'122'754	10'010'478	9'009'430	8'108'487	7'297'639	6'567'875
b) Depreciation percentage (%)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

Project:
KOSOVO_Zatric_Windbank_040913

Description:
Financial and economic analysis of the wind park Zatric with 15 Siemens SWT-3.0-113 turbines and a 10-year feed-in tariff of 85 €/MWh. In this scenario, an EU Grant of 12.5 Mio € and an interest rate of 4% is assumed.

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Calculated:
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Economy: WINDBANK (Financial & Economic analysis) - Graphs

Calculation: WP Zatric - Euro Grant 12.5 Mio, Interest Rate 4