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Study | Energy Economy

Renewable energy as an Opportunity for Economic Development in Kosovo

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

COOPERATION REPUBLIC OF KOSOVO FEDERAL REPUBLIC OF GERMANY

evroenergie

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Renewable energy as an Opportunity for Economic Development in Kosovo

GIZ Project

Economy and employment promotion

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COOPERATION REPUBLIC OF KOSOVO FEDERAL REPUBLIC OF GERMANY

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Abbreviations

EnC	Energy Community
ENTSO-E	European Network of Transmission System Operators for Electricity
EU	European Union
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
KfW	Kreditanstalt für Wiederaufbau
MW	Megawatt
MWh	Megawat per hour
GW	Gigawatt
GWh	Gigawattstunde
IT	Information Technology
ee	evroenergie
KEK	Korporata Energjetike e Kosovës Sh.A (Kosovo Energy Corporation)
KOSTT	Operator Sistemi, Transmisioni dhe Tregu (Transmission, System and Market Operator)
MZHE	Ministria e Zhvillimit Ekonomik (Ministry of Economic Devlopment)
MMPH	Ministria e Mjedisit dhe Planifikimit Hapësinor (Ministry of Environment and Spatial Planning)
ZRRE	Zyra e Rregullatorit të Energjisë së Kosovës (Kosovo Energy Regulatory Office)
NEK	NEK Umwelttechnik AG
M ü. M.	Meter über Meer (meters above the see)
GSM	Global System for Mobile Communications
Ha	Hectare
kV	Kilovolt
ELEM	Elektrane Makedonije
RLM	Registrierender Lastgangmessung (Registered Load Measurement)
SLP	Standardlastprofilkunden (Load Profile Customers)

Summary

Based on the projects presented in this study, a re-evaluation of the wind potential in Kosovo and other Western Balkan countries has been carried out in: Albania, Macedonia, Montenegro, Bosnia and Herzegovina and Serbia. In order to enable this reassessment, all results related to this topic statistical data published so far, have been included. Moreover, extensive researches, like interviews and surveys were conducted to represent the overall potential in Kosovo. Subsequent to the research conducted, merely Kosovo has the potential to generate wind energy of approximately 290 MW. The basis for this value is described further in this study, throughout the seven projects, all related to the topic of renewable energy from wind power. Within the frame of interviews and workshops, this value was discussed and verified with the different Institutional and corporate representatives from the energy sector, such as: The Ministry of Economic Development [MZHE], the Ministry of Environment and Spatial Planning [MMPH], the Transmission System and Market Operator [KOSTT], the Kosovo Energy Corporation [KEK], the Municipality of Shtime, NEK Umwelttechnik, Airenergy and Energykos. The analysed potential in the region is approximately 4,500 MW. This value represents only a summary of the potentials currently carried out through project reviews. The total potential of the Western Balkan region is somewhat higher, but it cannot be supported with clear facts in this study.

The development of renewable energy doesn't depend only on the geographic conditions. In particular, legal and economic frameworks, such as rates and promotion systems, licensing procedures and requirements for the network supply, make the necessary extension more difficult. The legal results presented in this study make it clear that the grounds (i.e network supply compensation) for the development of renewable energy systems have been created. However, these results are not optimally matched and lead to huge delays and complexities in licensing procedures.

By developing new areas of expertise, Kosovo could take the role of the supplier of specific components for wind turbines or act as a competent service in the energy

and IT sector for the neighbouring countries. Through such reorientation many new jobs could be created. The research revealed that only the field of construction and maintenance of wind turbines brings a potential of about 2,400 jobs and the area of the actual operation of the facilities creates about 780 jobs overall for the region itself. After the analysis of the primary and secondary economic effects, following the total potential, about 29,000 jobs in the entire Western Balkans region could be created. With a reasoned strategy for economic development, the development of a relevant education system with new areas of expertise, and a considerable development in the field of renewable energy, Kosovo would have a real opportunity to pioneer in the region and therefore would benefit more than other countries from the 29,000 jobs.

In the short term however, Kosovo could already benefit significantly through the investment in specific manufacturing of wind turbines. Kosovo is geographically located in the Southern Central part of the Western Balkan region, and offers good conditions for potential investments in the wind power area and the production of the wind turbines parts. Crucial, among other things here, are the educated and the youngest population of Europe[1], the positive EU accommodating Customs Regulations (CEFTA member)[2], the Euro as a currency, the sound bank system, and the existing factories, which could serve, with some reconstruction measures, for the production of these subcomponents.

Only the transport of wind turbine components (based on 4,500 MW) from some distant EU member states, such as Spain, would cost around 382 million euros. *((NEK Environmental Technology Ltd., 2012))* Therefore, a production site in Kosovo is economically a lot more efficient. The development of renewable energy, in the countries of Southeast Europe (Albania, Macedonia, Montenegro, Bosnia and

[1] According to the latest statistics of Kosovo (Agjencia e Statistikave të Kosovës - ASK, 2011/2012) 49,844 students are studying in Kosovar universities and are registered in professional colleges.

[2] Kosovo is a member of CEFTA, a free trade agreement between several Balkan countries and Moldova. The Country benefits also from EU trade preferences, making the products manufactured in Kosovo enjoy duty-free access in the EU. Thus the Kosovar exporters enjoy free access to regional and EU markets, which include over 500 million consumers. In addition, Kosovo enjoys also privileged access to the U.S. market.

Herzegovina, Serbia, Romania, Turkey and Bulgaria) through the signing of the Treaty of 25.10.2005 *(Energy Community. Treaty establishing the Energy Community (signed version)., 10.2005)* focuses on the establishment of a joint- energy community. The Southeast European countries (SEE countries), among other issues have committed to increase energy efficiency, to reduce the CO2 emissions, and advance the use of renewable energy up to 20% by the year 2020. Originating requirements from the third EU Single market package and other requirements laid down in this document, which are binding for all EU member states, in terms of electricity and gas markets, are also looked at throughout this study. Moreover, the transitional level of the implementation level in Kosovo is examined.

Overall it is expected, together with other requirements by the EU, in the process of the EU path, that the positive trend in the field of renewable energy will continue in the south-eastern Europe. Possibly now would be the right time for investing in building capacities in Kosovo, to positively influence the economic development of this emerging, young and dynamic country.

1 Wind energy and the economic effects as a result

1.1 Background

The development of an energy market and in particular renewable energy, plays a key role in Kosovo and could lead to further stabilization of the yet fledgling economy. Merely an efficient, modern and sustainable energy supply could ensure the development of new industries more quickly.

In October 2005, the Treaty establishing the "Energy Community of Southeast Europe" was signed by the European Community and by many countries of South East Europe. The EU Single energy market aims to extend to the countries of Southeastern Europe. They committed to implement the common law of the European Union on energy, to develop an appropriate regulatory framework and to liberalize the energy market. Currently, Kosovo is also obliged to implement the 3rd EU single market package, which among other issues, mainly focuses on the following:

- The development of renewable energy sources (i.e. wind and solar energy),
- Market access to all providers free of discrimination,
- The extension of cross-border infrastructure
- The EU-wide synchronization of market rules and network standards
- The strengthening of consumers protection
- The introduction of Smart Metering systems

The goal of the Energy Community is to create a law - stable and a market environment which triggers investments and thus ensures a reliable and continuous energy supply. The ground for this, is the establishment of a single regulated framework and an increased competition in the field of energy trade.

Liberalized energy markets improve and ensure a better level of energy supply and lead to better relations with the neighboring countries. Furthermore, the Energy Community, as a part of the European single market, aims to increase the energy efficiency and promote the development of renewable energy in order to also improve the ecological component.

1.2 Objective

The aim of this study is to present and evaluate the potential of Wind Energy in Kosovo and the Western Balkans.

In addition, it serves the Kosovo institutions, based on the needs for the expansion of the wind energy market, to raise the awareness of the overall economic development of Kosovo. In order to achieve this goal, in addition to this study, a workshop, with representatives of different institutions and companies from the Kosovo energy market, was organized.

The topics and the objectives of the workshop were as following:

- The presentation of the researched results of the wind energy potential in Kosovo and the region,
- The discussion of the 3rd EU single market package,
- The presentation of the legal requirements for extending renewable energy and the official processes for license acquisition on the construction and operation of wind power plants in Kosovo and other selected European countries,
- The review of possible partial production of components of the wind turbines and the opportunity to create new jobs.

The results of this workshop are incorporated in this study.

Based on the call of the 3rd EU- Single market package, to expand the production of electricity from renewable energy sources, the wind energy becomes increasingly important for Kosovo. Consequently, it is of particular importance to develop among the energy actors, the sense for the implementation of the EU directives and thus create a stable and a legal framework for further investments in Kosovo. In addition, by the establishment of a stable and continuous energy supply environment, further investments also in other sectors will be triggered. The third goal of this study is to present the potential of creating new jobs and also the economic growth of Kosovo due to the expansion of wind power generation. This extension represents also major opportunity for Kosovo to use new added values networks.

Through this expansion, in particular, the sectors of IT, metal and energy could be the winners in Kosovo and could also become the pioneers and the leaders in the region.

Through the development of new areas of expertise, new subject areas for study and also training facilities, Kosovo could expand its service offer in the IT and energy industry sector and provide, in addition to the benefits for their own country, these services also to other neighboring countries.

1.3 Research Methodology

While preparing this study, all the studies and statistics published so far, related to the potential of wind energy, the development of renewable energy and the economic start point, were researched and analyzed and also intensively discussed in a workshop, with various stakeholders of the Kosovo Energy Sector and GIZ. In order to be able to describe the potential of Kosovo in relation to the expansion of renewable energy (especially wind power), in addition to the geographic conditions, all the projects associated to the generation of wind energy, were reviewed. The keystone remains the mandatory requirements of the 3rd EU Single market package. Finally, after considering all the effective researches, conclusions on possible positive economy effects are presented, together with hands-on recommendations.

The focuses of the study, are in particular:

- The representation of previously written studies and projects on wind energy production in Kosovo.

The already carried out researches and studies were analyzed and the results are included in the study. In addition, further projects, which included any approaches to the topic of wind energy, were considered.

- Analysis of the EU requirements - in this case mainly the 3rd EU Single market package and the requirements which Kosovo has already met, or/ and the current level of implementation of these requirements.

At this point, the major policies of the 3rd EU Single market package were analyzed and displayed. Along with those lines, the requirements of energy sector for renewable energy in Kosovo are set.

- Considering the possibility of creating new jobs through the use of wind energy potential, as well as possibilities to produce wind turbine components for Kosovo and the region, in order to develop new added value networks.

The researched studies and projects and the following results of wind energy potential are the basis for the presentation of this development of renewable energies and also the consequent macroeconomic effects.

2 The Wind Energy Potential in Kosovo

Kosovo does not have a wind atlas or similar sources that could be used for advancing the use of wind energy. Thus, the wind energy potentials shown in this study are based on already conducted studies, respectively probable specific analyzes that have been carried out, as described in the research methodology.

The energy source from wind is still a new field for Kosovo, as the wind was previously used only for mechanical work (e.g. windmills).

2.1 The Analysis of Existing Studies on Wind Power in Kosovo and the Evaluation of the Wind Potential

The following chart presents the basic data for Kosovo. These data provide a first insight into the typical environment conditions such as climate, location, area, population and domestic production.

Chart 1. Basic data Kosovo

The Republic of Kosovo	
Climate:	influenced by continental air heaps, Kosovo results to face winters with heavy snow, then hot and dry summers and also transitional periods. Mediterranean and alpine influence create regional diversity, and the period of maximum rainfall is from October to December
Position:	Southeast Europe, between Serbia and Macedonia
Area land in km2:	10.887
Population	1.836.529 inhabitants
Gross domestic production :	Total: $ 13,020,000,000 Per/head: $ 6,500

Source: *(https://www.cia.gov/library/publications/the-world-factbook)*

Evroenergie analyzed in this study the already carried out wind energy projects and presents the respective results. The potential of Kosovo for developing renewable

energy, especially wind energy will be presented. In this regard, various institutions, that are active in the Kosovo in the energy sector, were contacted.

Among those are the following: KEK (Kosovo Energy Corporation) KOSTT (Transmission System and Market Operator), MZHE, (the Ministry of Economic Development), MMPH (the Ministry of Environment and Spatial Planning), ZRRE (Energy Regulatory Office) and also different enterprises, which started concrete projects for metering, for potential offers or are related to obtaining licenses in relation to wind energy. As part of an analysis of the current state, all publications were intensively researched and analyzed. In particular, the study of the company NEK *(NEK UMWELTTECHNIK AG - Wind Resource Assessment Final Report - Kosovo, 2012)* was the focus.

The feasibility study on wind power in Kosovo, which includes wind measurements of approximately 10 locations, served merely for drafting a regional wind map, which was offered to potential investors and operators of wind farms, only as basic information. Furthermore, the conditions for wind farm development in Kosovo were evaluated. In May 2009, the wind measurement campaign began at 10 different locations. The conducted wind measurements supplied NEK with sufficient data, to create a wind resource card for Kosovo and to follow up with suitable locations for future projects for the construction of wind turbines.

The results of that study are presented in the chart below. The main criteria of the tests were the respective locations, the wind speed and the intervals of the measurements.

Chart 2: Location Criteria of NEK Study

Name of the Analysis	NEK WIND PARK „ZATRIC" (30 MW) RAHOVEC, KOSOVO	NEK WIND RESOURCE ASSESSMENT, FINAL REPORT	NEK WIND RESOURCE ASSESSMENT, FINAL REPORT	NEK WIND RESOURCE ASSESSMENT, FINAL REPORT	NEK WIND RESOURCE ASSESSMENT, FINAL REPORT	NEK WIND RESOURCE ASSESSMENT, FINAL REPORT	NEK WIND RESOURCE ASSESSMENT, FINAL REPORT	NEK WIND RESOURCE ASSESSMENT, FINAL REPORT	NEK WIND RESOURCE ASSESSMENT, FINAL REPORT	NEK WIND RESOURCE ASSESSMENT, FINAL REPORT
Date	01.04.2012	01.12.2010	01.12.2010	01.12.2010	01.12.2010	01.12.2010	01.12.2010	01.12.2010	01.12.2010	01.12.2010
Locations	Zatric, Rahovec BBZAT	Lypjan BBUT	Lypjan ETEC	Gjilan EBUD	Theranda BBUD	Theranda SDUL	Klina WGJU	Abri e Eperme EABF	Prizren BBZYM	Kacanik SSTA
Height in Meters	35	37	33	33	38	34	44	45	37	37
Sea level in M	1016	1055	733	592	1667	858	578	763	658	578
Wind Speed m/s	7.14.	NA	3.6.	3.3.	7.0.	4.4.	3.8.	4.6.	3.4.	4.1.
Air Pressure			92.87 kPa	94.45 kPa	82.89 kPa	91.49 kPa	94.61 kPa	92.54 kPa	93.71 kPa	94.61 kPa
Air Density			1.141 kg/m³	1.157 kg/m³	1.037 kg/m³	1.128 kg/m³	1.159 kg/m³	1.138 kg/m³	1.149 kg/m³	1.159 kg/m³
Temperature			10.2 °C	11.2 °C	5.68 °C	9.43 °C	11.3 °C	10.1 °C	10.7 °C	11.3 °C
Start	01.02.2011	22.07.2009	22.07.2009	23.07.2009	25.07.2009	26.07.2009	24.07.2009	23.07.2009	24.07.2009	28.07.2009
End	31.01.2012		16.08.2010	16.08.2010	16.08.2010	24.08.2010	24.08.2010	24.08.2010	25.08.2010	25.08.2010
Duration in Mon.			13	13	13	13	13	13	13	13

Source: own presentation based on *(NEK UMWELTTECHNIK AG, 2012)*

NEK Company convinced by the potentials and conditions in the country, continued to be active in Kosovo.

As part of the NEK wind farm development, for a 30-MW wind project, the location Zatric (Rahovec) was chosen for further wind measurement. It has excellent wind conditions and has a well developed infrastructure. For some time, measurements on already existing GSM-Mast[3], were carried out. At the same time the company started to build a wind farm there and to obtain all the relevant permits. End of June 2012, NEK submitted the official application for a 30-MW wind farm project in Zatric, at the ZRRE (Energy Regulatory Office), aiming to obtain the permission to start with this project as soon as possible. NEK assumes that the first major wind farm in Kosovo, will be fully granted by respective authorities in the winter of the year 2012/2013. According to recent publications, NEK has decided to start working on a second project in Budakova, near Prizren. A wind farm with a future capacity of approximately 30 - 40 MW is planned for that location. This wind farm is to be built 1200-1600 meters above the sea.

Project Shtime 1 & Shtime 2

Directed by a German company (name shall remain anonymous), measurements were made at the site of Shtime. In the report, KOSTT (Transmission System and Market Operator) provided the application for the network connection. The application was filed already in 2010. The power provided there is 127 MW. The results of the projects were presented at the workshop and were regarded as real.

Projekt Golesh

The first and the only wind power plants in Kosovo were installed in Golesh.

[3] Global System for Mobile Communications

In 2010, these facilities were put into operation. The installed capacity is 1.36 MW.

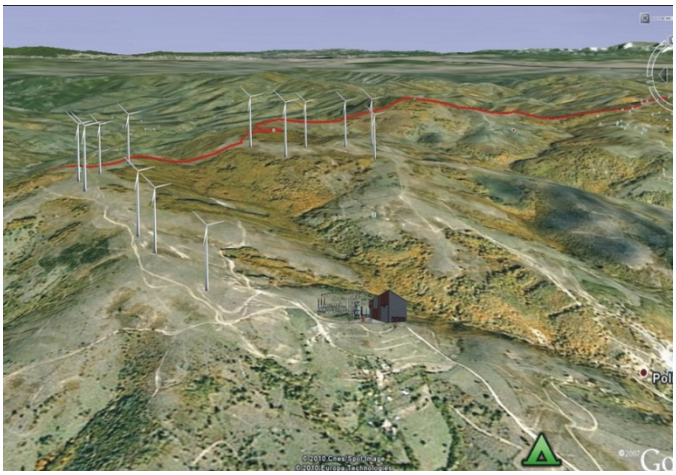
Shortly after they became operational, the power plant shut down. According to official statements of ZRRE these plants were depreciated (outdated) and were therefore not entitled to the full supply intended for the production of renewable energy from wind. In this regard, currently negotiations between the plant operator and KEK are being carried out. The site Golesh is known for its good wind conditions, however, there are no studies or readings found.

Figure 1. Windpower Location Golesh 1

Source: *(evroenergie L.L.C, 2012)*

Figure 1 illustrates three wind turbines, which were installed in Golesh but due to the shutdown they don't produce electricity.

Project Kitka



The company Air Energy performs now for some time measurements carried out by the German company "Anemos" in Kitka. According to the company, Air Energy, the data proved to be quite suitable.

Figure 2. Air Energy Location Kitka

Source: *(Anemos & AirEnergy, Wind data analysis – Kitka, Kosovo – Mast Measurement, 22.12.2011)*

The company is collecting the necessary licenses for the construction of a wind farm. Also an application for power supply for an energy output of 30 MW has been submitted to KOSTT. Figure 2 shows the location of Kitka with the planned wind turbines.

Project Bajgora & Skenderaj (Energykos)

Currently in Bajgora and Skenderaj, a Kosovo-Italian cooperation is carrying out measurements. The first results show a potential of a three-digit megawatt range and are extremely promising. In the respective locations 2 anemometers[4] are put, to carry out measurements.

Figure 3. Energykos Location Bajgora 1
Source: *(evroenergie L.L.C, 2012)*

[4] Gauge for measuring wind rate

Only in Bajgora, in an area of 7 hectares, an average wind speed of 9 to 12 m / s, was measured.

During a visit at the site, the above picture was taken and the above measurements were confirmed.

2.2 Summary of the Results gathered in Kosovo

The compilation of the results obtained in the Chapter 2.1, as shown in Chart 3, show a total potential of 288.36 MW (excluding the location Budakova).

Based on the above projects and measurements carried out, Kosovo could be a very good starting point for the development of wind energy. Furthermore, the result does not exclude further potential expansion of wind turbines.

Chart 3. Presentation of Projects in Kosovo

Kosovo		
Nr.	Project	Performance in MW
1	Shtime 1	100
2	Shtime 2	27
3	Kitka,	30
4	Golesh(Windpower)	1.36
5	Nek Zatriq	30
6	Bajgore	50 (measurements carry on)
7	Skenderaj	50 (measurements carry on)
	Total	288.36

Source: Nek Study *(NEK Umwelttechnik AG, 2012)* and Interviews together with surveys carried out by Evroenergie [5]

[5] Interviews with institutions, like: Ministry of Economy, Ministry of Environment and Spatial Planning, KOSTT, KEK, NEK, Municipality of Shtime and also officials from different companies

3 Potential of Wind Energy in the Region

At this point, only the basic data of Albania, Macedonia, Montenegro, Bosnia and Herzegovina and Serbia are presented. In addition, country-specific projects and their basic data are listed.

3.1 Wind Energy Potential in Albania

Chart 4. Basic data Albania

The Republic of Albania	
Climate:	mild temperatures, cool moist winters, hot, clear summers.
Position :	Southeastern Europe, surrounded by the Adriatic Sea and the Jon, positioned between Greece in the south and Montenegro and Kosovo in the north.
Area Land in km2:	28.748
Population:	3.002.859 Inhabitants
Gross domestic production:	Total: $ 25,230,000,000 Per/Head: $ 7,800

Source: *(https://www.cia.gov/library/publications/the-world-factbook)*

Albania is one of the most 'water-rich' countries of the world. Thus, more than 90 percent of the electricity generated is provided by hydroelectric plants. In addition, Albania has an advantageous geographical location, with a very rich wind energy potential, both onshore as well as offshore facilities.

So far, seven companies submitted their applications for the construction of wind farms at the Albanian Energy Regulatory Office *(ERE - Enti Rregullator i Energjise)* and were licensed by the respective authorities.

See further the presentation of some projects.

Project Kappet:

This project covers an area of 4,125 hectares, where a wind farm is expected to build. A study carried out, found that the noise level reaches the range of 40 db. The total output of this wind farm will be 150 MW. This represents an annual energy production of 383,000 MWh. *(Project Kappet)*

Project Vlore:

This project will have a total capacity of 500 MW, corresponding to an annual production of 1,250 GWh (for the assumed value of 2,500 full-load hours per year). *(http://www.thewindpower.net/windfarm_de_10415_vlore.php)*

Project Kryevidh:

The project Kryevidh should reach a total capacity of 150 MW, corresponding to an annual production of 375 GWh (for the assumed value of 2,500 full-load hours per year). At this location, 75-wind turbines should be built.

(http://www.thewindpower.net/windfarm_de_18829_kryevidhi.php)

The basic data of this and other licensed projects are shown in the following chart.

Chart 5. Presentation of Projects in Albania

Nr.	Project	Enterprise	Performance in MW
1	Project Kappet	Hera shpk	150
2	Grykderdhja e Shkumbinit, Terpan	Alb Wind Energy shpk	225
3	Kavaje, Kryevidh	ERS-08 shpk	40
4	BPGE 1, BPGE 2 Lezhe	Biopower Green Energy shpk	230
5	Kryevidh, Kavaje	Union Eolica Albania shpk	150
6	Butrint, Markat	E-Vento srl Albania shpk	72
7	Vlore	Enpower Albania shpk	500
Total			1.367

Source: *(Skedari i Licencave deri ne qershor 2012)*

3.2 Wind Energy Potential in Macedonia

Chart 6. Basic Data Macedonia

The Republic of Macedonia	
Climate:	warm summers, transitional periods and relatively cold winters with heavy snowfall
Position:	South eastern Europe, at the northern Greece
Land area in km^2:	25.713
Population:	2.082.370 Inhabitants
Gross domestic production:	Total: $ 21,620,000,000 Per/Head: $ 10,500

Source *(https://www.cia.gov/library/publications/the-world-factbook)*:

The strategy of the Republic of Macedonia, as part of the wind power production, requires that by the year 2020, the electricity output ranging from 180 to 360 GWh, is generated by renewable energy. *(Ministry of Economy of Macedonia, 2010)*

However, until now there are no wind power plants in Macedonia. In 2005, a document *(Analytica Thinking Laboratory, 2011)* which resembles information wise to a wind atlas was drafted.

This document defines the most suitable locations for wind energy generation. In April 2011 then followed the agreement for the construction of the wind farm in Bogdanci. *(Analytica Thinking Laboratory, 2011).*

Project Bogdanci:

This project is so far the first project, which is in the implementation phase. The wind farm in "Bogdanci" should be completed in 2013 as the first major wind farm in Macedonia. The investment for this project amounts € 55 million. KfW (Loan Institution for Reconstruction), finances the project with a loan of about 32,9 € million. The rest of the amount is provided by the Macedonian power supply company ELEM (Elektrane Makedonije). ELEM announced that after an international tender procedure, the Greek-German consortium Terna-Siemens was awarded the contract to construct and install the wind turbines, the required infrastructure, and the sub-stations together with the power lines. With an installed capacity of 37 MW, the entire electricity production should reach approximately 100 GWh per year. *(https://www.cia.gov/library/publications/the-world-factbook).*

In addition, eight projects with a total capacity of 340 MW, have been submitted to the Macedonian Energy Regulatory Office so far. Currently there is no more information that can be obtained regarding these projects. The potentials of the above mentioned individual projects are presented in the following chart.

Chart 7. Presentation of Projects in Macedonia

Nr.	Project	Enterprise	Performance in MW
1	Bogdanci	Consortium Terna-Siemens	37
2	Potential Investors	8 Potential Investors	340
Total			377

Source: *(Erneuerbare Energien_ Mazedonien baut ersten Windenergiepark « SOLID - Wirtschaft und Technik am Bau. Österreichs Magazin für Baugewerbe, Bauindustrie und Immobilien und Policy Reforms to Promote Energy Efficiency and Renewable Energy Investments).*

3.3 Wind Energy Potential in Montenegro

Chart 8. Basic Data Montenegro

Republik Montenegro	
Climate:	Mediterranean climate, hot and dry summer with relatively cold winters in the inland and heavy snowfalls
Position :	Southeastern Europe, between the Adriatic Sea and Serbia
Area Land in km2:	13.812
Population:	657.394 Inhabitants
Gross domestic production:	Total: $ 7,249,000,000 Per/Head: $ 11,700

Source: *(https://www.cia.gov/library/publications/the-world-factbook)*

In 2010, Montenegro adopted a new law on energy. This law regulated among other issues also the feed-in tariffs for electricity, water and wind power and also biomass energy and thereby laid down the foundation for the expansion of renewable energy. *(dena - Deutsche Energie Agentur & BMWI - Bundesministerium für Wirtschaft und Technologie, http://www.exportinitiative.de/nachrichten/nachrichten0/back/81/article/neuveroeffentlichung-laenderprofil-montenegro)*

According to the Environmental Protection Agency of Montenegro, the Wind potential in Montenegro can be 'classified' to be at a high level. Along the Adriatic coast, an average wind speed of 6-7 m/s is measured. Currently there are 2 on-going and developing projects in Montenegro (Mozura and Krnovo).

Project Mozura:

The first wind farm is about to be realized also in Montenegro. This is the project "Mozura" situated between Ulcinj and Bar. The project was approved by the Montenegrin government in late May 2010. The Spanish company Fersa Energias

Renovables (the only bidder in the international tender) and his Montenegrin partner Celebic, should build this wind farm the latest 2 years after signing the agreement.

The plant will have a total installed capacity of 46 MW, while the total investment amounts € 65 million.

Project Krnovo:

The second project in Montenegro is currently still in the authorization process by the government in Podgorica, This is the project Krnovo, near Niksic. Regarding this project, the consortium Mitsubishi Heavy Industries and Ivica Consulting (Vienna) submitted the application to the respective authorities. This offer provides for a capacity of 50 MW and a possible extension of 22 MW, and the Investment is estimated to reach the amount of 70 to 90 million €.

Other projects could follow in the near future. According to the Ministry of Economy in the past two years, five companies applied for permits to carry out wind measurements. *(Montenegro plans with wind power)*. The described projects Mozura and Krnovo are shown in the following chart once more summarized.

Chart 9. Presentation of Projects in Montenegro

Nr.	Project	Enterprise	Performance in MW
1	Mozura	Fersa Energias Renovables	46 MW
2	Krnovo	Mitsubishi Heavy Industries und Ivica Consulting	72 MW
Total			118

Source: *(Montenegro plant mit Windenergie)*.

3.4 Wind Energy Potential in Bosnia and Herzegovina

Chart 10. Basic data Bosnia and Herzegovina

The Republic of Bosnia and Herzegovina	
Climate:	hot summers and cold winters, at high altitude cool summers and long winters, rainy winters along the coast
Position:	South eastern Europe, near the Adriatic Sea and Croatia
Land ares km^2:	51.197
Population:	3.879.296 inhabitants
Gross domestic production:	Total: $ 32,040,000,000 Per/Head: $ 8,200

Source: *(https://www.cia.gov/library/publications/the-world-factbook)*.

Bosnia and Herzegovina has good indigenous energy resources, which however have not been used previously. In addition there's a lack of the necessary strategy in the energy sector. However, since a long time, there are compensation rates for electricity from renewable sources. The liberalized energy market up to 60% from 2015, should be opened soon.

Around 66% of primary energy consumption is covered by lignite (brown coal), while other fossil fuels, such as natural gas and crude oil are imported, and cover about 20% of the consumption. In the renewable energy sector, Bosnia and Herzegovina has also available another important primary energy resource, which is hydropower. Despite the high potential, the country uses only 40%. According to a government decision, water and wind are the future renewable energy sources in the country, which is why the focus lies on the development of this area. *(dena, BMWI, & (B&H))*

Project Podvelezje

The power company 'Elektroprivreda Bosne i Hercegovine' has given the green light for the construction of a large wind farm, through the announcement of a tender for the construction of wind turbines in Podvelezje. The requirements of this call include:

drafting the project, supply, installation and construction of 16 wind turbines together with maintenance services.

The planned performance is estimated at 32 to 48 MW, which amounts to an annual power production from 75 up to 100 GWh. The investment is estimated to be around 63.9 million. The 16 wind turbines are scheduled to become operational in late 2014.

(http://www.gtai.de/GTAI/Navigation/DE/Trade/maerkte,did=79168.html).

According to the study ''Security of Energy Supply in Bosnia and Herzegovina'' which was published in September 2010, Bosnia and Herzegovina had no wind turbines until now. It offers, however, the ability to install 600 MW generated by wind power. Nevertheless, 12 locations with high level of potential have been identified. *(Ministry of Foreign Trade and Economic Relations of Bosnia and Herzegovina, 13.09.2010)*

The chart below describes the projects:

Chart 11. Presentation of projects in Bosnia and Herzegovina

Nr.	Project	Enterprise	Performance in MW
1	Podvelezje	JP Elektroprivreda Bosne i Hercegovine d.d. Mostar	32 up to 48
2	Security of Energy Supply in Bosnia and Herzegovina	Ministry of Foreign Trade and Economic Relations of Bosnia and Herzegovina	600
Total			648

Source: *(Ministry of Foreign Trade and Economic Relations of Bosnia and Herzegovina, 13.09.2010), (http://www.gtai.de/GTAI/Navigation/DE/Trade/maerkte,did=79168.html)*

3.5 Wind Energy Potential in Serbia

Chart 12. Basic Data Serbia

The Republic of Serbia	
Climate:	in the north faced by continental climate (cold winters and hot, humid summers with well dispersed rainfalls) other parts of the country face Mediterranean climate (relatively cold winters with heavy snowfall during the summer while transition periods are hot and dry)
Position :	Southeastern Europe, between Macedonia, Kosovo and Hungary
Area Land in km2:	77.474
Population:	7.276.604 inhabitants
Gross domestic production:	Total: $ 79,880,000,000 Per/head: $ 10,800

Source: *(https://www.cia.gov/library/publications/the-world-factbook)*

In 2011, Serbia adopted a new law on energy, in which the renewable energies were added as a supplementary part. In addition to the setting-up of the legal framework, a number of projects are currently being planned in different areas. According to the Serbian Investment and Export Promotion Agency (SIEPA)'', the Ministry of Energy granted licenses for projects, with an approximate total capacity of generating 1.4 GW. However, except some small hydropower plants, no specific projects have been implemented so far.

As potential sites for the construction of wind turbines, quite a lot suitable regions were identified. *((Serbia Investment and Export Promotion Agency (SIEPA)).*

Project Bavaništansko Polje

At the site Bavaništansko Polje, a wind farm with a potential generation of 188 MW is planned. In total, 94 wind turbines à 2 MW will be constructed.

According to the wind potential analysis, this location has been rated as appropriate. In addition, this location offers excellent technical conditions and relatively low costs for connecting the wind turbines to the network, since there are, a 110 kV and a 400 kV transmission networks near the site. *(Wellbury Wind Energy doo Belgrade Serbia)*.

Projekt Cibuk

The wind farm Cibuk will be constructed about 50 km close to Belgrade, in the Kovin municipality. This project is divided into two phases of construction: Cibuk 1 and Cibuk 2.

Cibuk 1 includes the construction of 57 wind turbines with an installed capacity of 3 MW. After these turbines become operational, the second phase of construction is scheduled to begin. This includes the installation of 43 additional wind turbines, whereby the wind farm would increase to a total number of 100 wind turbines, with a total capacity of generating 300 MW.

An 11 km long high voltage line is planned for this project. The planned investment amounts to € 450million. *(http://www.wpc.rs/en/projekat/razvoj-projekta)*

The following chart summarizes the procedures and lists as well other projects.

Chart 13. Presetnation of Projects in Serbia

Nr.	Project	Enterprise	Performance in MW
1	Wind farm "Vracev ga	Bela Crkva	187,5
2	Wind farm "Bavaništansko polje"	Wellbury Wind Energy Belgrade	188
3	Wind farm "Vršac – Alibunar-Plandište"	Energowind Vršac	400
4	Wind farm "Čibuk"	Vetroelektrane Balkana Belgrade	300
5	Wind farm „Krivaća"	Ivicom Energy Ţagubica	112,8
6	Wind farm "Košava"	Zad Mk-Fintel Wind Belgrade	117
7	"Cestobrodica"	Boljevac	280
8	Wind farm "Sušara"	Windtim Belgrade	60
9	Wind farm „Indjija"	Vetropark Indjija	20
10	"Alibunar"	Alibunar	48,3
11	Wind farm "La Picollina"	Vrsac	11
12	"Kula"	Kula	9
Total			1.733

Source: *(http://www.energy-community.org)*

3.6 Summary of Results in the Western Balkans

The countries that have been reviewed, have a total potential of generating 4,532 MW of wind energy. Since this potential was calculated solely on the basis of the implemented and planned projects , it does not describe the "real" potential. These figures however also illustrate the enormous performance capacity of the region. Nevertheless the current insufficient use presents an objection.

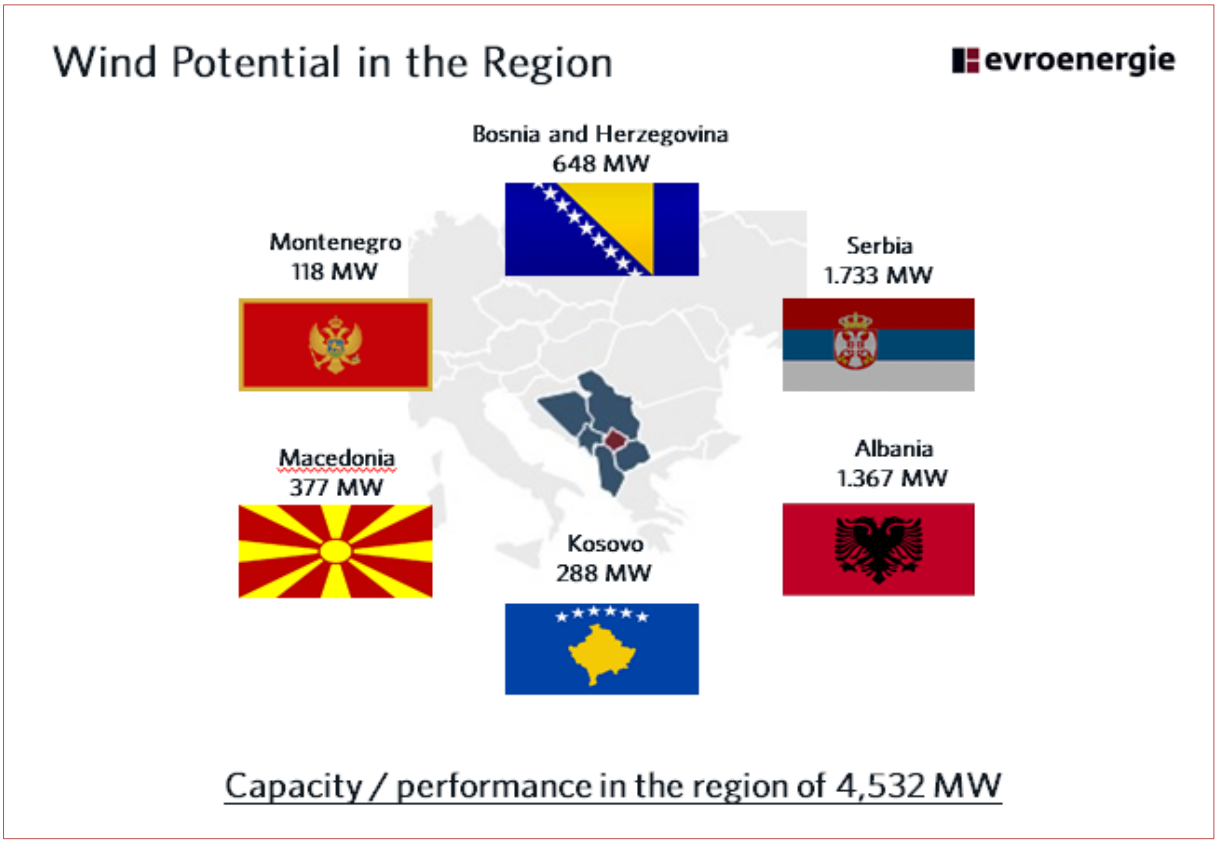


Figure 4. Wind Potential in the Region

Source: Own Presentation based on Studies and Project data

4 Development in the EU and the Target/Actual Comparison in Kosovo

4.1 3. EU-Single Market Package

Global change and environmental disasters (e.g. oil rig disaster in the Gulf of Mexico, or nuclear power plant accident in Fukushima) demanded a necessary rethink on the use of the limited resources and the production of energy. The EU has understood the need for this change and has set out a corresponding and binding Single market package for electricity and gas for all EU states. With the release of the 3rd EU Single market package, which is also binding for Kosovo and other Balkan countries, the generation of electricity from renewable sources is especially promoted. As chapter 3 illustrates, there is great potential for wind energy generation in the countries reviewed, but which currently is insufficiently used or not used at all. The requirements of the EU will keep the market for renewable energy growing also in the future and therefore also trigger investors, respectively improve the labor market, with the creation of new jobs in this area. Further, the requirements as described in the EU Single market package will be shown together with the highlight on the level of implementation opportunities in Kosovo. The requirements of the 3rd EU Single market package - target state. In September 2007 the European Commission presented the 3rd EU Single market package for electricity and gas, which finally was adopted on the 22nd of April 2009, after several modifications and amendments by the European Parliament and the European Council. The EU Single market package should contribute to the promotion of increased competition, improve security of supply and strengthen the consumer rights. In the view of the European Commission, this is how the still insufficient energy market liberalization will be intensified.

4.1.1 Content of the 3rd EU-Single Market package

- Directive electricity: Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC
- Directive gas: Directive 2009/73/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in natural gas and repealing Directive 2003/55/EC
- Regulation electricity: Regulation (EC) No 714/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity and repealing Regulation (EC) No 1228/2003
- Regulation gas: Regulation (EC) No 715/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the natural gas transmission networks and repealing Regulation (EC) No 1775/2005
- Regulation ACER: Regulation (EC) No 713/2009 of the European Parliament and of the Council of 13 July 2009 establishing an Agency for the Cooperation of Energy Regulators

4.1.2 Consolidation of Renewable Energies

In 2008, the European Union and its member states have agreed to a climate change package. The main objectives include the so-called 20-20-20 targets, which should be achieved by 2020.

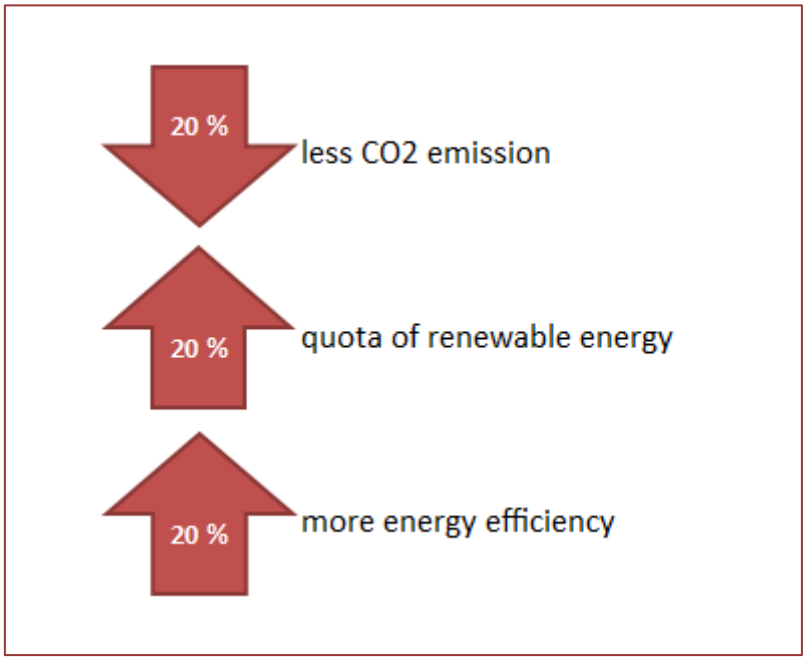


Figure 5: Die 20-20-20-Goals of the EU

Source: own presentation – EU objectives according to the directives and the objectives for climate and energy protection

Although these goals represent three different approaches, they are very much related to each other. Thus, for instance, the use of renewable energy can increase when the energy efficiency also increases, and consequently the energy consumption decreases. Both measurements automatically lead to a lower CO2 emission. As a result, the development of wind energy projects plays a crucial role to achieve the objectives of the 20-20-20 agenda.

4.1.3 Market Access to all Providers Free of Discrimination

To ensure an effective division between the production and network operation in the transmission and the transmission ranges, the power supply companies can refer to the three options of the so-called unbundling:

- Legal ownership separation between the production and network operation (ownership unbundling),

- Obligation of vertically integrated energy companies to deliver network operations to an Independent system operator (Independent System Operator - „ISO“) or
- Creation of an independent transmission or transmission system operator (Independent Transmission Operator - „ITO“).This may indeed belong to the parent group, but must be independent from the production in relation with the organization and the management. *(DIRECTIVE 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity).*

4.1.4 Strengthening Consumer Protection and the Introduction of Smart Metering

The end user should not only be able to choose their suppliers, but can also switch the supplier within three weeks. Consumers have the right to transfer all of their energy consumption data. If necessary, the consumer has the right to claim compensation and reimbursement, if in the contract agreed performance, qualities are not met, and this includes also inaccurate or late bills. Furthermore, through this Directive, there should be the possibility that vulnerable customers are favored by policy measures at the national level (so-called energy poverty). *(DIRECTIVE 2009/72/EC concerning common rules for the internal market in electricity).*

Another focus is the introduction of smart metering systems, "smart meters"[6].

After a positive economic assessment by all Member States, the new directive on electricity of the 3rd EU Single market package foresees the introduction of "smart metering systems" for all consumers. As a result, by the year 2020, at least 80% of consumers are to be equipped with smart meters.

The advantages among other issues, in introducing the Smart Meters, are:

[6] A smart meter is a digital, electronic energy meter, which is not based on counter to conventional, electromechanical Ferraris, but on a digital technology. Its development was possible doe to the continuous progress in the areas of communication and computer technology.

- Less costs through remote activation and deactivation,
- Reducing the load of maximum network and thus reduce network investment and operating costs,
- Increased efficiency by detection of malfunctions on timely manner,
- Awareness of the possibility to save energy through timely reading and
- consumption and cost information at hand

4.1.5 The Establishment of the Agency for Cooperation of Energy Regulators (ACER)

To meet the regulatory requirements of the Member States at a Community based level, an Agency for the Cooperation of Energy Regulators was established. This agency is a Community body with its own legal entity and is responsible for issues related to the tasks of Energy Regulators.

The Agency plays an important role in the development of framework conditions, which must comply with the 'Netzcodizes', moreover, it reviews the implementation of the tasks of the ENTSO-E electricity and gas (European Network of Transmission System Operators for Electricity).

(REGULATION (EC) No 713/2009 establishing an Agency for the Cooperation of Energy Regulators).

4.2 The EU Requirements and the Presentation of the Laws in Kosovo in regards to the Renewable Energy – the Actual State

Further, the level of the implementation of the EU requirements in Kosovo is presented.

4.2.1 A more Effective Division between the Networks and Energy Production to ensure a Discrimination Free Access to the Market

KEK was responsible until recently for the following areas:

- Brown coal and mining
- Production of energy
- Distribution – (network operation)
- Sales – (Electricity supply)

Through the privatization process, the responsibilities related to the distribution and sales have been passed on to KEDS (KEK Electricity Distribution and Supply). As a result, an effective separation of energy production on one side and the network and on-sales on the other side, and also the first form of privatization, have been achieved.

4.2.2 Strengthening Consumer Protection and the Introduction of Smart Metering

While the 3rd EU Single market package calls for the change of the supplier with a maximum implementation period of three weeks, in Kosovo there is still no possibility for households to choose the supplier. The only source of energy for local consumers is KEK.

The introduction of smart metering systems has been already mentioned in fact, and some of these measuring systems have been already installed, but only with some commercial and industrial customers-registry Performance (RLM- Registered Load Measurement).

The introduction of these measuring systems would not only bring similar benefits as in other EU countries, but also help reduce the commercial energy losses that exist in Kosovo.

4.2.3 Energy Regulatory Office in Kosovo – ZRRE

The independent regulatory body was founded in June 2004 by the Parliament of the Republic of Kosovo.

The ZRRE ensures that the legal framework of Kosovo's energy sector is in line with the "acquis communautaire"[7].

4.2.4 Energy Strategies for Renewable Energy in Kosovo

In 2005, Kosovo's parliament adopted the energy policy objectives for the period 2005-2015. These objectives were revised in 2009 and were submitted by the Government to the Parliament for approval, for the new period covering 2009-2018. After several months of discussion at the Kosovo Parliament, the objectives were finally adopted on th 1st of April 2010. Similar to the original energy policy objectives 2005-2015, the updated version focused mainly on power generation by lignite (brown coal).

Although the Kosovo Energy Strategy 2009-2018 includes studies on the reserves of lignite, and evaluates the two existing power plants and also new investment opportunities, it carries no studies on alternative forms of energy, such as wind, solar or geothermal energy.

This strategy provides only the indicative targets for renewable energies. They are presented in the chart below in MW.

Chart 14: Indicative targets for renewable energy

Renewable Energy	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Hydro (<10MW)	26,50	28,30	30,50	32,90	35,10	37,50	40,00	42,70	45,50	48,40
Wind	0,00	0,00	0,00	14,90	31,40	49,60	69,40	91,20	115,10	141,50
Solar	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Biogas and Biomass	0,00	0,00	0,00	0,00	0,20	0,30	0,30	0,40	0,50	0,50

Source: (ZRRE Decion – Promotional tariffs for renewable energy, 2011).

[7] The entire law on the Eureopen Union, as long as it is valid, is summarised by the term 'acquis' or 'acquis communautaire'. It is about 15'000 regulations and directives printed in about 1000 pages (2008). The whole EU law is available online at (www.eur-lex.europa.eu)

4.2.5 The Law on Energy

This law sets out the general principles and rules to ensure a safe energy supply and creates the conditions for a functioning market. Furthermore, this law promotes the efficient use of energy, an increased production of electricity from renewable sources and aims at improving the environment. Applicable areas of this law include: electricity, heating, gas and renewable energy. This law foresees that the energy policy strategy is in line with the set objectives related to renewable energy.

Article 11 of the law on Energy sets the guidelines for renewable energy sources with the objective of promoting economic and sustainable use of renewable energies.

The Ministry is among other issues, also committed to the following:

- Drafting of a medium- and a long-term implementation plan for renewable energy, which are in line with the commitments of the Kosovo framework agreement on Energy Community,
- Monitoring the implementation of the guidelines for renewable energy and
- Defining objectives and usage of renewable energy.

According to this law, Distribution system operators (DSOs) and transmission system operators (TSOs) should be prioritized for the supply of electricity from renewable energy. It should be noted that supply should be done only as deemed necessary and according to the network code and as specified in other codes (The purpose of this limit is the power stability).

DSOs and TSOs shall set unified rules regarding the costs for all the technical adjustments and publish them accordingly. To be mentioned here are: network connection, network reinforcement and connection of renewable energy. These rules must be submitted to the Energy Regulatory Office for approval and, they must comply with the Energy Strategy of Kosovo and are based on the objectives, transparent and non-discriminatory criteria. *(Parliament of Kosovo, Law No. 03/L-184 ON ENERGY, 2010)*

4.2.6 The Law on Electricity

This law sets out the general rules concerning the implementation of production, transmission, distribution and sales activities. Furthermore, also the activities related to the access for transmission and distribution and also the functioning of the market are determined. This Law also determines the licensing procedures for the activities in the field of electricity and also the authorization and tendering procedures for new capacities. The power production companies that produce electricity, using renewable energy sources, have the right to a certificate of origin issued by the Energy Regulatory Office.

The certificate of origin includes;

- The confirmation of the maximum production capacity and renewable energy sources used for power production,
- Deadlines for the submission of information and reports to the Energy Regulator, concerning the operation of production facilities,
- The Public Power Supply Corporation, which is prioritized in regards to the purchase of renewable energy, which is in possession of a certificate of origin issued by the Energy Regulatory Office,
- The public Power Supply Corporation which is required to purchase entire generated energy from renewable energy sources and is shows regulated tariffs and
- The Energy Regulator, which created a methodology for the determination of the fees and the feed-ins of renewable energies. *(Parliament of Kosovo, LAW NO. 03/L-201 ON ELECTRICITY, 2010)*

4.2.7 The Law on Energy Regulatory Office

This law regulates the operation of the energy regulator as an independent agency of the Republic of Kosovo. The Law defines the powers, duties and functions of the Energy Regulatory Office. Moreover it specifies also the conditions for granting

licenses, for performing energy activities in the energy sector, for issuing permits for the construction of new generating capacity, for the creation of competitive energy markets and the criteria for the regulation of tariffs and conditions for power supply..

(Parliament of Kosovo, Law No. 03/L-185 ENERGY REGULATORY OFFICE, 2010)

4.2.8 Analysis of the Attached Codes of KOSTT - The Code for Generation of Wind Energy

The aim of this document is to present a vivid and independent description on the performance of technical and operational requirements related to the producers and operation of wind turbines, which will be connected to the power system of Kosovo and therefore wish to join the Kosovar electricity market.

Specifically, this document covers the following:

Planning Code - operators of wind turbines which apply for one power supply connection to the transmission network, must be informed that they are to submit their construction plans, and detailed project information, so that the transmission operators can carry out the appropriate examinations on the establishment and on the access.

Connection Code - specifies the requirements that must be met by the transmission operators, the connected users or respectively the applicants.

The operating plan covers a one year period, before the transition into the real-time operation, and consists of three sub-codes:

- Code for planning shutdowns: time plans for network disconnections.
- Code for the evaluation of the system: Includes the evaluation of the net safety and the load forecast.
- Code for planning: covers the process of planning for the next day.

The accounting code includes balanced operations between generation and load in real time. This consists of three sub-codes:

- Distribution Code, covers the processes and procedures for the distribution, accounting, support services and emergencies

- Code on frequency control covers the processes of frequency control of the network and
- Code of the voltage test, deals with the regulation of the voltage control and the control of reactive power.

The operation code is divided into a number of sub-codes, and consists of:

- The review and monitoring code which specifies the procedures for approval related to the audit and monitoring compliance with the requirements of the users of the network codes,
- The operating connection code of providing information, which covers the exchange of information in normal statuses and in statuses of emergency.
- The code on security coordination, which refers specifically to the procedures for approval of deliverables and / or testing a link.
- The code on planning unforeseen incidents, which covers the provisions of unforeseen incidents and the plans for the recovery of the network in cases of total or partial failure.
- The code on the plant and equipment labeling, which represents the responsibilities and procedures for the use of inventory and nomenclature.
- The code on the network test, which covers the set-up for performing the tests and inspections of production facilities. *(KOSTT – Network Code)*

4.2.9 Connection Rules and Feed-In Tariffs

The feed-in tariffs for electricity production from wind power (only with the new technologies) are calculated by the Kosovo Energy Regulatory Office based on the average of the compensation rates of neighboring countries, such as: Croatia, Macedonia, Slovenia and Lithuania.

The resulting rates are shown in the following chart, and apply to all generators of the new-technology levels.

Chart 15. Wind Energy Feed-in Tariffs in Kosovo

Remuneration	In € Cent per kW/h
New Wind Turbines	8,4

Source: *(ZRRE Decision – Promotional tariffs for renewable energy, 2011).*

The following chart lists the tariffs for water, biogas and biomass that were set by the Energy Regulatory Office.

Chart 16. Feed-in tariffs in Kosovo from renewable energy

Generation from new Energy soures	Remuneration EUR /MW
Hydropower (<10MW)	63,3
Solar energy	Not available
Biogas und Biomass	71,3

Source: *(ZRRE Decision – Promotional tariffs for renewable energy, 2011)*

Since the beginning of 2009 some foreign investors applied at the KOSTT in Kosovo, for a network connection to the transmission network, with a planned total capacity of 157 MW.

So far three network connection requests were filed for wind turbines at KOSTT: *(KOSTT, TRANSMISSION DEVELOPMENT PLAN 2012 - 2021, 2011)*

- Project Shtime 1 with the performance of 100 MW, Southeast of Kosovo
- Project Shtime 2 with the performance of 27 MW, Southeast of Kosovo
- Project Kitka with the performance of 30 MW, East of Kosovo

From the technical point of view, there is a possibility that these wind turbines are connected in the network at the 110 KV voltage level.

The transmission network can integrate these generation capacities in terms of energy flow into the network, while in terms of energy balance, the total of variable amounts of energy could cause difficulties for the TSOs, since the transmission system currently has no sufficient reserves adjustable.

This fact could change in the future, if the plans on the development of new conventional generation capacity are realized and result of an increase in adjustable reserves is created. Accordingly the unpredictable variability of energy production is covered by wind turbines.

4.3 Presentation of Licensing Requirements in Kosovo

4.3.1 Obtaining Licenses for the Construction and Operation of Wind Power Plants

The energy authority is responsible in Kosovo for the licensing process and the acquisition of the license for the construction and operation of wind power plants. Until there is an actual supply of renewable energy, two documents are required, the approval for the construction of new capacities and the licensing application for energy production. These two documents contain a number of requirements, of which the most important are listed below. The original documents with the respective required approvals can be found on the official website of the Kosovo Energy Regulatory Office.

The application for the construction of a new capacity has the following requirements:

1. The first general requirement is the collection of 12 authorizations. These include among others: the registration certificate as a commercial enterprise; confirmation for the establishment of the consortium, association or partnership (treaty / status of the association) certificate by the competent authority that the applicant is not going through insolvency proceedings, that his company is not taken over by the court and that its commercial activities are not unprotected.
2. As part of the technical and organizational requirements 10 more permits are needed, including the organizational structure of the applicant for the implementation of the project; biographies (Resumes / CV) of the project officers; Biography (Resume / CV) of the authorized representative of the applicant.

3. Regarding the financial requirements 4 permits, such as the confirmation of investment amount or cost estimate, are needed.
4. The environmental law and other relevant legal requirements, including those on the law on water, require each a permit. *(ZRRE – Authorization application for building new capacities).*

4.3.2 The Licensing Application for Energy Production

The licensing application for energy production demands the submission of 23 permits.

Among the permits inter alia, the certificate of registration of the applicant as a business organization, which is issued by the authority for business registration is requested; also the business plan of the sponsor for the next three years together with the amortization schedule for the production facility is demanded.

All the necessary requirements are summarized in the following Chart. *(ZRRE – Licence Application for energy production)*

Sequence of Procedures	Additional Info
Application for Building New Capacities	
General requirements	12 permits
Technical and organisational requirements	10 permits
Environmental requirements	1 permits
Other relevant legal requirements, including the law on the water	1 permit
Financial requirements	4 permits
Licensing Application for Energy Production	
Certificates/ Documents that must be attached	23 permits
Total	51 permits

Figure 6. Summary of the Licensing Procedures in Kosovo
Source: Own presentation based on the official licensing procedures in Kosovo

Thus a total of 51 permits from the Kosovo government authority for energy are required as proof, before the supply can start.

Some EU countries were analyzed in this report related to the periods of the authorization procedures, and are shown in the following chart:

Chart 17. Periods of Authorization Procedures for the Establishment of a Wind Farm

Country	Average duration
Finland	8,25 months
Austria	10 months
Rumania	15,26 months
Italy	18,06 months
Belgium	20,33 months
Bulgaria	23 months
Eastland	24,35 months
UK	26,87 months
Hungary	27,46 months
Lithuania	30 months
Germany	30,12 months
Czech Republic	31,56 months
Latvia	36 months
Poland	43,09 months
Greece	50,09 months
Spain	57,74 months
Portugal	58,03 months

Source: *(Projekt „Wind Barriers“)*

The approval processes in the most countries shown above, have much easier procedures and request much fewer permits than in Kosovo. To achieve the goal of being able to be situated in the wind energy market, the existing approval processes are to be reconsidered and revised. Failure to do so, Kosovo will be listed towards the end in the chart above and therefore may not only fail to achieve the EU requirements but also lose the great opportunity to become a pioneer of the region.

4.4 A Look on the facts about Wind Energy in the EU

The objectives of energy policy, are a functioning energy market, like the security of energy supply, the promotion of energy efficiency and renewable energy as well as the interconnection of energy networks between Member States. Since the Western Balkan countries are aiming to become EU members, the political objectives of the European Union should be adopted.

Below, it will be shown that the wind energy market in Europe is seemingly and constantly growing. The remaining western Member States in particular, are already benefiting from the production, the construction and the use of wind turbines. It is

recommended for Kosovo to ascend on this path and use the associated economic effects on the labor market, as described in section 4.6, because one thing is certain:

The energy market in the European Union, in terms of wind energy is booming!

In the EU, according to European statistics, alone in 2011, 9,616 MW of new wind power capacity, reaching a total investment of 12.6 billion Euros were installed. Thus, the proportion of renewable energy installed in 2011, was 21.4% of the total installed power generation capacity. The annual installations of Wind Turbines rose steadily for 17 years. An average annual market growth of 15.6% has been observed. Europe's total output of wind power is currently about 94,000 MW. With the installed capacity, about 204 KWh are generated annually. This represents 6.3% of the total energy consumption in the EU. *(EWEA - THE EUROPEAN WIND ENERGY ASSOCIATION, 2012)*

The following charts show the EU, the EU candidates, EFTA countries and their respective installed capacity.

Chart 18: Installed wind Energy Performance in the EU

		Installed 2010	End of 2010	Installed 2011	End of 2011
	Capacity in the EU				
1	**Austria**	19	1,014	73	1,084
2	**Belgium**	325	886	192	1,078
3	**Bulgaria**	322	500	112*	612*
4	**Cyprus**	82	82	52	134
5	**Czech Republic**	23	215	2	217
6	**Denmark**	315	3,749	178	3,871
7	**Eastland**	7	149	35	184
8	**Finland**	52	197	0	197
9	**France**	1,396	5,97	830*	6,800*
10	**Germany**	1,493	27,191	2,086	29,06
11	**Greece**	238	1,323	311	1,629
12	**Hungary**	94	295	34	329
13	**Ireland**	82	1,392	239	1,631
14	**Italy**	948	5,797	950*	6,747*
15	**Latvia**	2	30	1	31
16	**Lithuania**	72	163	16	179
17	**Luxemburg**	1	44	0	44
18	**Malta**	0	0	0	0
19	**Netherlands**	56	2,269	68	2,328
20	**Poland**	456	1,18	436	1,616
21	**Portugal**	171	3,706	377	4,083
22	**Rumania**	448	462	520	982
23	**Slovakia**	0	3	0	3
24	**Slovenia**	0	0	0	0
25	**Spain**	1,463	20,623	1,05	21,674
26	**Sweden**	604	2,163	763	2,907
27	**UK**	1,005	5,204	1,293	6,54
	Total of EU-27	**9,648**	**84,65**	**9,616**	**93,957**

Source: *(EWEA - THE EUROPEAN WIND ENERGY ASSOCIATION,, 2012)*

** Provisional values*

Chart 19: Installed Wind Energy Performnace (MW) in the EU candidate and EFTA countries

	Installed 2010	End of 2010	Installed 2011	Ende of 2011
EU candidates				
Croatia	61	89	42	131
Macedonia	-	-	-	-
Serbia	-	-	-	-
Turkey	528	1.329	470	1.799
Total	**589**	**1.418**	**512**	**1.930**
EFTA				
Island	-	-	-	-
Liechtenstein	-	-	-	-
Norway	18	436	84	520
Switzerland	25	42	3	46
Of wich Off-shore und Nearshore	-	2	-	2
Total	**43**	**478**	**87**	**566**
Faroe- Islands	-	4	-	4
Ukraine	1	87	66	151
Russia	-	9	n/a***	n/a***
Total	**1**	**100**	**66**	**155**
Total EU-27	**9.648**	**84.650**	**9.616**	**93.957**
Total Europe	**10.281**	**86.646**	**10.281**	**96.608**

Source: *(EWEA - THE EUROPEAN WIND ENERGY ASSOCIATION,, 2012)*

**not communicated*

The EU Member States have massively accelerated the development of wind power from year to year. This marked an annual growth of an average of 15.6% between 1995 and 2011.

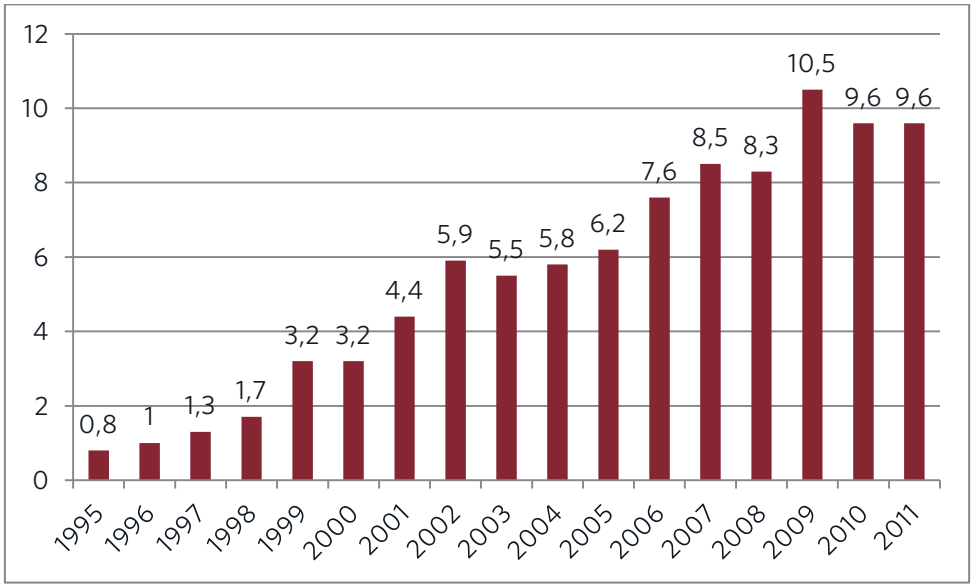


Figure 7: Annual Trend of Wind Power Installations in GW in the EU Member States from 1995 -2011

Source: *(EWEA - THE EUROPEAN WIND ENERGY ASSOCIATION,, 2012)*

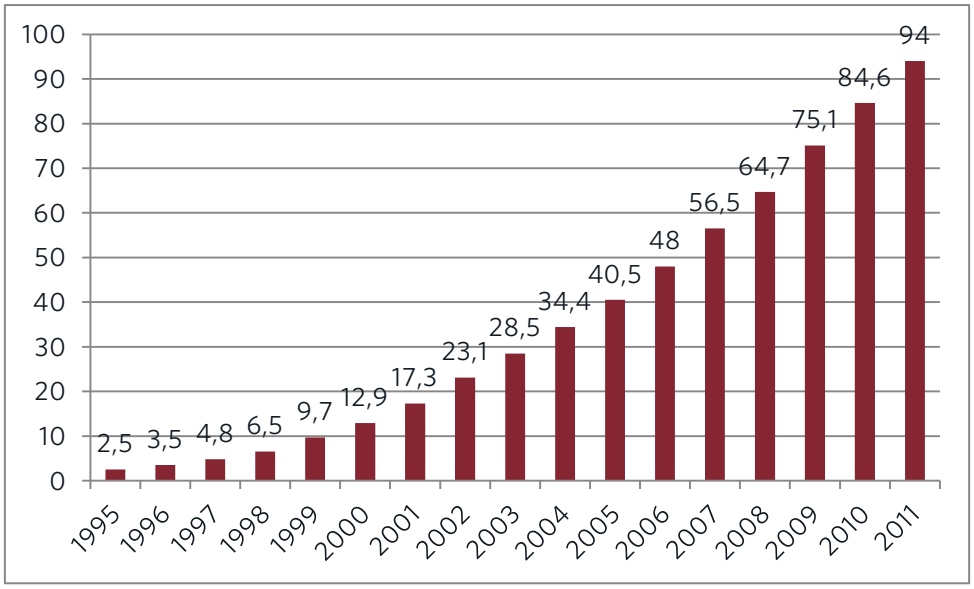


Figure 8: Overall installed Wind Energy in the EU (GW)

Source: *(EWEA - THE EUROPEAN WIND ENERGY ASSOCIATION,, 2012)*

The chart below refers to the market share of installed wind power in the EU Member States. Germany remains the EU country with the largest installed capacity, followed

by Spain, Italy, France and Britain. Nine other countries have over 1 GW of installed performance: Portugal, Denmark, the Netherlands, Sweden, Ireland, Greece, Poland, Austria and Belgium.

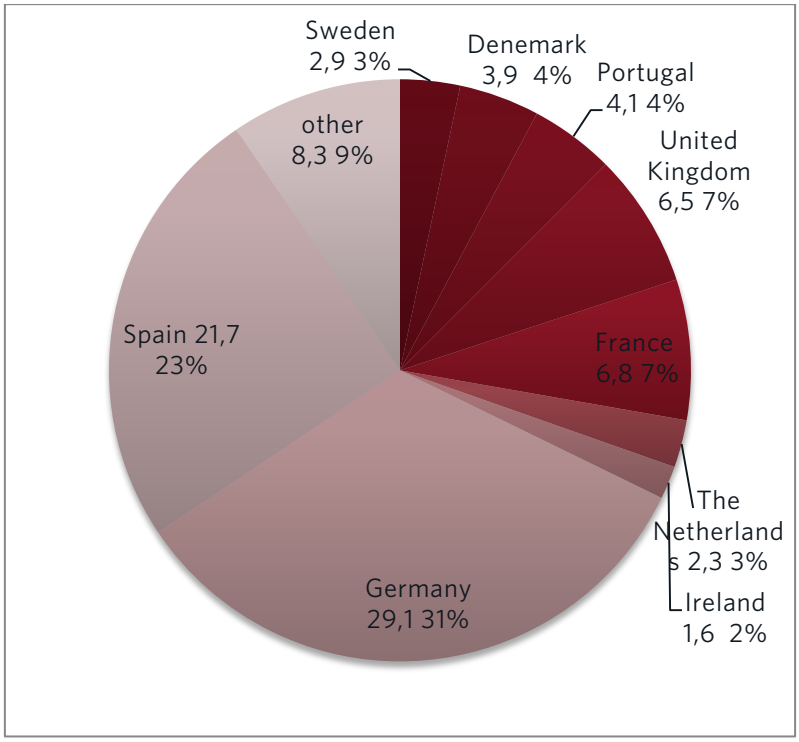


Figure 9: EU- Member States shares of total installed performance 2011

Quelle: *(EWEA - THE EUROPEAN WIND ENERGY ASSOCIATION,, 2012)*

Denmark is the country with the highest wind energy dispersion of the total energy consumption of almost 26%, followed by Spain with 15.9%, Portugal 15.6%, Ireland 12%, and Germany (10.6%).

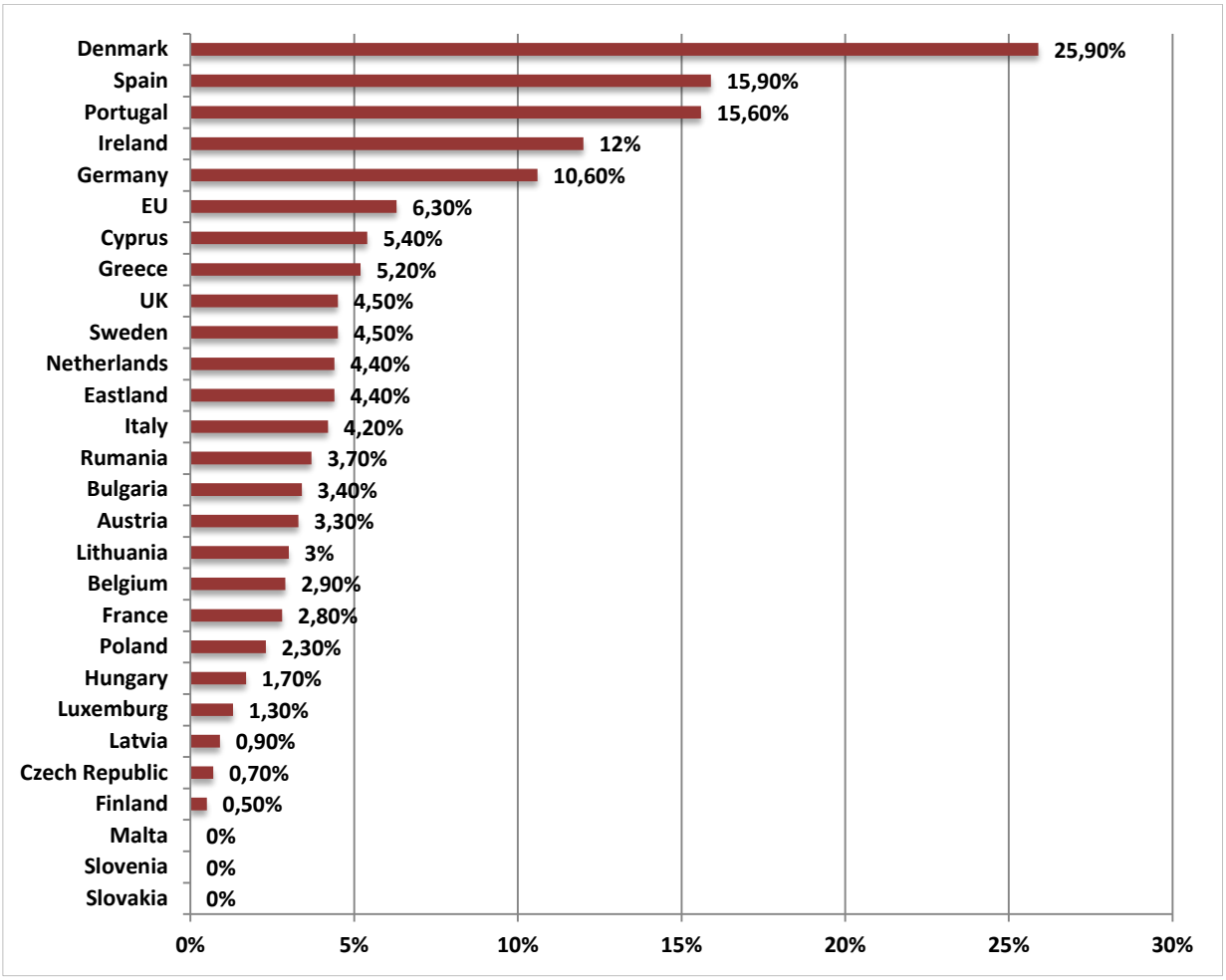


Figure 10: EU-Member states wind energy propotion share of the total energy consumption

Source: *(EWEA - THE EUROPEAN WIND ENERGY ASSOCIATION,, 2012)*

4.5 Extension of Wind Energy in the EU and the Creation of New Jobs

The development of wind energy has for a long time been an engine for the creation of new jobs. The studies carried out in EU Member States *(EWEA - THE EUROPEAN WIND ENERGY ASSOCIATION,, 2012)* show the expansion of wind energy through the expansion of wind power. In addition to new jobs, also other areas of the economy are developed.

The municipalities are in many ways important for the present and the future development of renewable energy: They have extensive control possibilities regarding the approval and the installation of plant conditions. Additional funding, own municipal utility or becoming renter facilitators of the network access. The municipalities increasingly expand their own targets for renewable energy and strive for the establishment of companies related to the renewable energy sector.

Municipalities benefit from the positive regional economic developments associated with the use of renewable energy:

- Savings in fossil fuel costs,
- Creation of new jobs, or
- Tax and Lease income.

Many cities, towns and regions have set as their goal to strengthen regional economies through renewable energy as their development strategy, whereby the municipal budget situation and the attractiveness of the business location is to be improved. The complex chains of added values of renewable energy are rarely located entirely within the borders of a single country and thus are difficult to be differentiated.

This study differentiates the following added value effects:

- Profits
- Income
- Taxes
- Empoyment
- Economic development
- Education

The local value added in employment includes among others. the following tasks: installation, maintenance and operation of the facilities. This means that most orders such as handicrafts, service technicians or service raw material supplies are carried out by local businesses. The resulting regional output and the economic dynamics offer good regional perspectives.

The chart below shows the added value chain, in some areas also create new jobs.

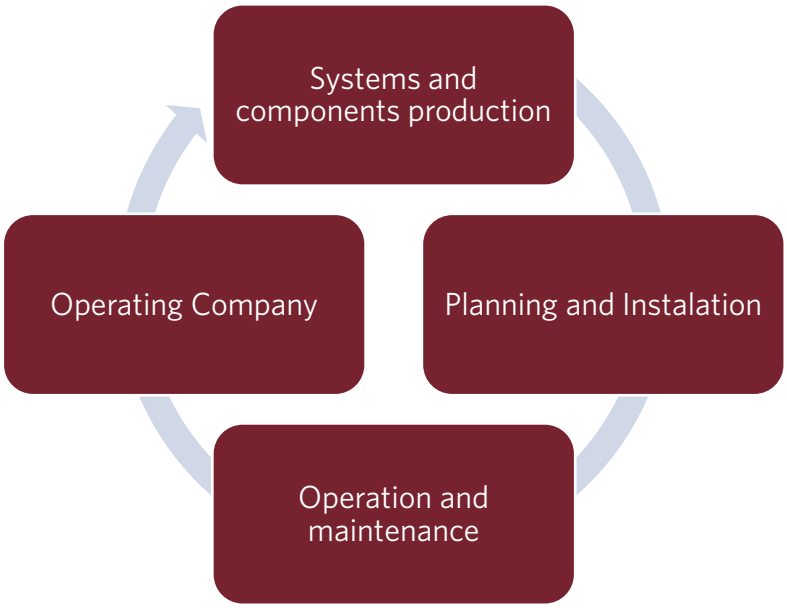


Figure 11: Added value chain
Source: Own presentation

At the certain stages of production mainly companies that generate profits, create jobs and pay taxes. The figure below shows the neologism in the above mentioned areas. At the ame time, the components and their structure are shown.

Systems and Components Production		Hub and Mainshaft
		Gondola
		Generator
		Tower
		Blades
		Transmission gear
		Azimuth System
		Hydraulics
		Wire
		Sensors
Planning and Installation		Fundament
		Development
		Network connection
		Services
		Material production
Operation and Maintenance	Maintenance and Repair	Personal
		Production of compensational material
		Electricity
		Insurance
	Lease payments, dismantle	Personal
		Logistics
		Renaturation
		Lodgment
		Revenues from secondary raw material
	Banks	
Operating Company		Enterpreneurship
		Liability charges
		Distribution

Figure 12: Added value in areas

Source: Own presentation

The following figure illustrates that the vast expansion of wind energy creates new jobs at the same time. Only during the year 2010, 238.000 people were employed directly or indirectly in the context of wind energy generation. At the same time 119,000 GWh of energy were generated from wind. Associating these trends with the planning of the development of wind energy, by 2030 794,000 people in the EU will

be working for the wind energy production. Hence 872,000 GWh of electricity produced by wind are projected.

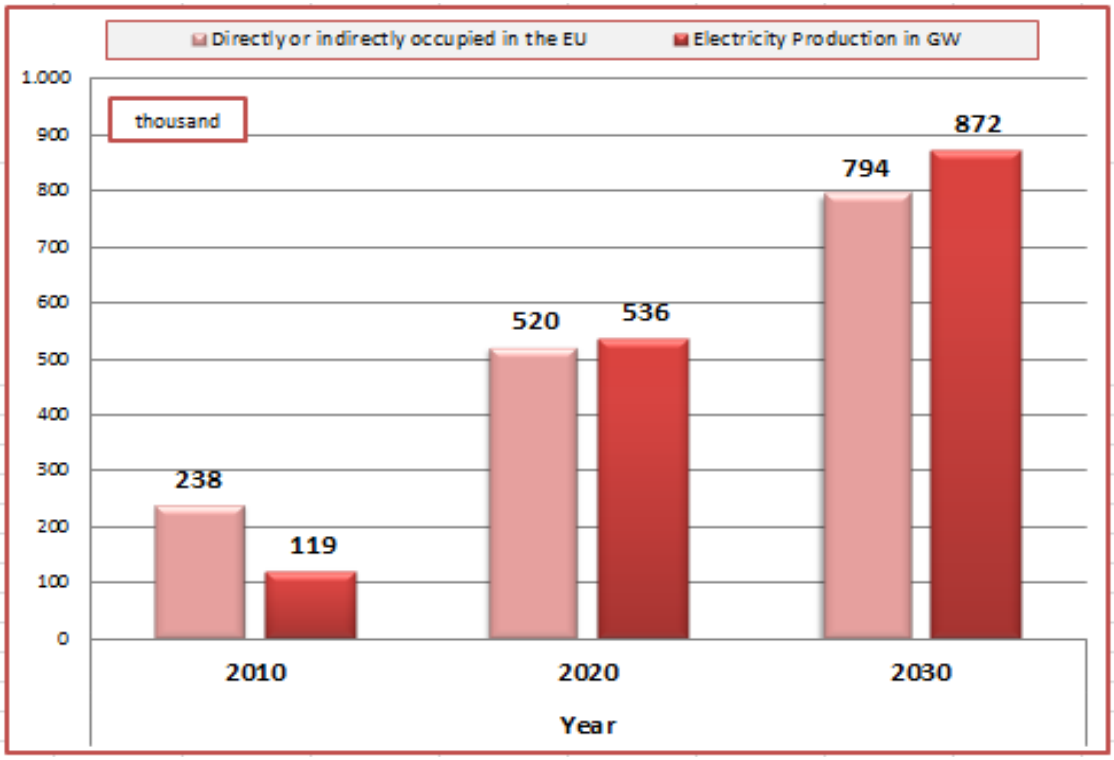


Figure 13: Employment and wind power generation in the EU 2010 - 2030

Source: *(EWEA - The European Wind Energy Association, 2012), (VDMA Power Systems - Strommix in der EU27, 2010)*

The impact of the development of wind energy has various effects on the entire economic chain. The sectors that benefit the most are the following:

- Base metal
- Electrotechnical and electronic equipment
- Transport
- Metal production and processing
- Construction
- Financial Institutions
- Professional services
- Rubber and plastic industry
- Post und Telecommunication
- IT-Services
- Research and Development
- Chemical Products

Figure 14: Involvement of sectors in the development and expansion of wind energy

Source: (EWEA - The European Wind Energy Association, 2012)

The effects of the expansion of wind energy can be determined even in the gross domestic product of the EU Member States . The total contribution of the wind energy sector to the gross domestic product of the EU reaches 0.26%, or 32 billion Euros. *(EWEA - The European Wind Energy Association, 2012)*

5 Employment Potential through the Development of Renewable Energy in Kosovo and the Region

As the first part of this study has shown, Kosovo and the surrounding region offer great potential for renewable energy. Currently, the energy demand of Kosovo and the surrounding region is mainly produced by coal and water, while the additional required electricity is imported. Through the use of natural phenomena like coal, hydro, solar and wind, there are opportunities to develop new added value chains.

In Kosovo and the region, a lot of new and active projects on wind energy production started or are already underway. The projects were initiated because of the high potential of wind energy in the Balkan region. In order to describe the theories on the use of wind potential and their impact on the various sectors of the economy, the EU energy market and, in particular, the wind energy market and its development were considered.

Fact is that although in Kosovo and the region, an enormous wind potential was observed, no wind turbine or wind farms are involved yet in energy production.

But there are major sectors along the added value chain that could benefit from the expansion of renewable energies. Not to be underestimated is the point that just by using wind energy, new neologism is built. But when a nation acts as a pioneer and pushes the development of new added value chains foward, they could benefit from this greatly. New jobs are generated even through the smallest projects with minimal installed capacity.

In the following, the newly emerging added value chains, which are directly affected by an increased use of renewable energy, are reviewed.

- Production of equipment and components
- Planning and installation
- Operation and maintenance

In order to maximize the profit from the mentioned added value chains, should the country or the municipality be involved in all areas of service performance market. The carried out studies that are based on interviews in the market and the statistics,

result with no concrete and reliable figures for the possible new jobs for Kosovo and the Balkan region. Therefore, the data used in this study, are the ones which have been identified in the EU wind energy market for years.

If we analyze the employment in the wind energy market, then two different types of employment can be noticed. The direct and indirect employment opportunities. Under direct employment belong the wind turbine manufacturers and the manufacturing of components. Additional jobs are included in this concept, like planning offices and specialized service providers such as service, maintenance and operation. Under indirect employment are included jobs like working in the concrete industry, transportation and logistics, financial services and the steel industry.

The study of BMVIT – *(BMVIT – Bundesministerium für Verkehr Innovation und Technologie, 2011)*, 129 wind power operating companies in Austria, and in the regions like Carinthia, Upper Austria, Lower Austria, Styria and Vienna, were asked about the number of their employees. They had in 2010, 173 full-time employees and produced a total capacity of 1,010.6 MW. If the overall performance is calculated with jobs, the result shows a value of 0.17 jobs per MW of power. *(BMVIT – Bundesministerium für Verkehr Innovation und Technologie, 2011)*

The above mentioned method is used in this study, for the jobs, based on the wind potential in MW in Kosovo and calculated for the rest of the Balkan region.

The impact on the countries considered in this study, are shown in the following chart.

Chart 20: Permanent employment in the Operating Companies

Operating Companies Basis 0,17 Jobs / MW			
Nr.	Land	MW	Jobs
1	Kosovo	288	50
2	Albania	1.367	236
3	Serbia	1.733	300
4	Bosnia and Herzegovina	648	112
5	Montenegro	118	20
6	Macedonia	377	65
	Total	4.532	784

Source: Own Presentation. (The calculating methodology of *(BMVIT – Bundesministerium für Verkehr Innovation und Technologie, 2011)*).

In the chart below, jobs are presented that could result from operation, repair and maintenance. For the calculation of the possible jobs , also the above study *(BMVIT – Bundesministerium für Verkehr Innovation und Technologie, 2011)* was used as the ground. According to this study for 1 MW installed wind power capacity, 0.54 jobs would be created.

In the regions where the wind generation is not something new, the know-how for the operation, for the repair and maintenance of wind farms would be built with time.

For Kosovo, 156 jobs would be created in this area.

The effects on other countries considered in this study are shown in the following chart.

Chart 21: Permanent jobs for the operation, repair and maintenance

Operation, Repair and Maintenance Basis 0,54 Jobs / MW			
Nr.	Land	MW	Jobs
1	Kosovo	288	156
2	Albania	1.367	738
3	Serbia	1.733	936
4	Bosnia and Herzegovina	648	350
5	Montenegro	118	64
6	Macedonia	377	204
	Total	4.532	2.447

Source: Own Presentation. (The calculating methodology of *(BMVIT – Bundesministerium für Verkehr Innovation und Technologie, 2011)*

The following chart shows the primary and secondary effects along the added value chain. This method, which is also called the input - output analysis, *(BMVIT – Bundesministerium für Verkehr Innovation und Technologie, 2011)* was used in this study to estimate the economic effects. The objective of the input - output analysis is to identify both direct and indirect production linkage. It should be ascertained that the overall effects emenate from a given and a change in demand.

The primary effects can be divided into direct and indirect effects. Direct effects, are effects that create immediate economic sectors. The sectors that would be strongly affected with direct effects by the investment in wind farms are the manufacturer of the generators of wind turbines, blade manufacturers, builders and installers. The directly affected sectors, providing a wholesale service for the affected sectors are grouped under indirect effects. In there are included inter alia the Suppliers of component manufacturers, the chemical industry supplying with fiber, transportation and engineering. The income from primary effects is used for consumption and investment opportunities. This provides additional employment opportunity and additional income. All effects that result from the primary income are called secondary effects. From the primary and secondary effects, for one installed wind power MW, 6.4 jobs could be created.

Primary Effects	
Direct Effects	Indirect Effects
• Directly affected industries • Producers of generators • Construction companies • Installers	• directly affected economic sectors that provide a progress in an industry • suppliers of component producers
Secondary Effects	
The income from primary effects is also used for consumption and investment. This provides additional value added, employment and income. All effects arising from primary income are named secondary effects.	

Figure 15: Primary and Secondary Effects

Source: Own presentation. Definitions from *(BMVIT – Bundesministerium für Verkehr Innovation und Technologie, 2011).*

Through this could Kosovo, with a wind power potential of 288 MW, create approximately 1,840 jobs. Albania, with a wind performance potential of 1,367 MW could provide about 8,750 jobs. Serbia could create about 11,095 jobs with a wind performance potential of 1,733 MW. Bosnia and Herzegovina, Montenegro and Macedonia, with a wind power potential of each of 648, 118 and 377 MW, would finance about 4,147, 755 Euros and 2,413 jobs.

Chart 22: Primary and Secondary Employment effects

Primary and secondary Employment effects Basis 6,4 Jobs/ MW			
Nr.	Land	MW	Jobs
1	Kosovo	288	1.843
2	Albania	1.367	8.749
3	Serbia	1.733	11.095
4	Bosnia and Herzegovina	648	4.147
5	Montenegro	118	755
6	Macedonia	377	2.413
	Total	4.532	29.002

Source: Own Presentation. (The calculating methodology of *(BMVIT – Bundesministerium für Verkehr Innovation und Technologie, 2011)*

5.1 Production and Export of Wind Turbine Components and Services for Energy and IT Sectors of Kosovo Neighbor Countries

The development of new added value chains in Kosovo very much depends on how far the policy, specifically on renewable energy, creates a framework for the promotion of foreign investment. The following illustration will show how the primary and secondary effects for Kosovo will benefit only by strong investment in these sectors.

For the production of individual components, Kosovo offers some advantages, and these would be the following: The excellent location in the Balkans and the modern highway connection to Albania also creates easier transportation possibilities. Two more infrastructure projects in Serbia and Macedonia will follow. Worth mentioning is also the young population, with an average age of 25 years. The average gross wage in Kosovo is around EUR 290 *(Auswertiges Amt, 09.2012)*. Kosovo counts over 40,000 students *(Agjencia e Statistikave te Kosoves - ask, 2011 / 2012)* in two public and many private universities and also many students studying aboard, who ensure highly skilled potential employees. Since 1999, the General Assembly of Kosovo was

based on completely new foundations, thus compatible with EU requirements. Since 2002, the Euro is its official currency.

For Kosovo and the Balkan region, it is hard to imagine producing the components of a wind turbine independently at this time. This study will show the real possibilities that Kosovo would have in short, medium and long term in the sectors along the added value chain (supply of products and services). In this part of the study, sectors that have a potential for expansion through the development of wind energy sector, are analyzed and displayed. The production and manufacturing sector, could position themselves very well with a lot of components in the value chain. In addition, all components that are produced in this sector could be called the primary direct effects. From this, it can be seen that the more of the components described are produced in Kosovo and exported to the region, the greater the economic development and job creation in Kosovo. With the development and expansion of wind power, the infrastructure and construction sectors would be newly established and could develop further. The expansion of wind energy requires the construction or development of energy industry services and the IT sector. Particularly in those sectors, Kosovo would have a real chance to evolve over its competitors in the region and offer the necessary services. In this study, the focus was on two particular sectors. The first sector is the metal processing industry, which by the production of wind turbines and its components, such as towers or heavy plates for tower plants for the entire region, Kosovo could benefit greatly. This would be a great challenge; however it would also be a possibility for economic development for Kosovo. Another focus, but which is not less important, is the service in the energy and IT industries. Again, Kosovo should and could position itself in the new and rapidly evolving energy markets and expand the range of services and deliver them to neighboring countries. The chart below shows the sectors along the added value chain, which in the short term, medium term and long term, represent a great potential for development.

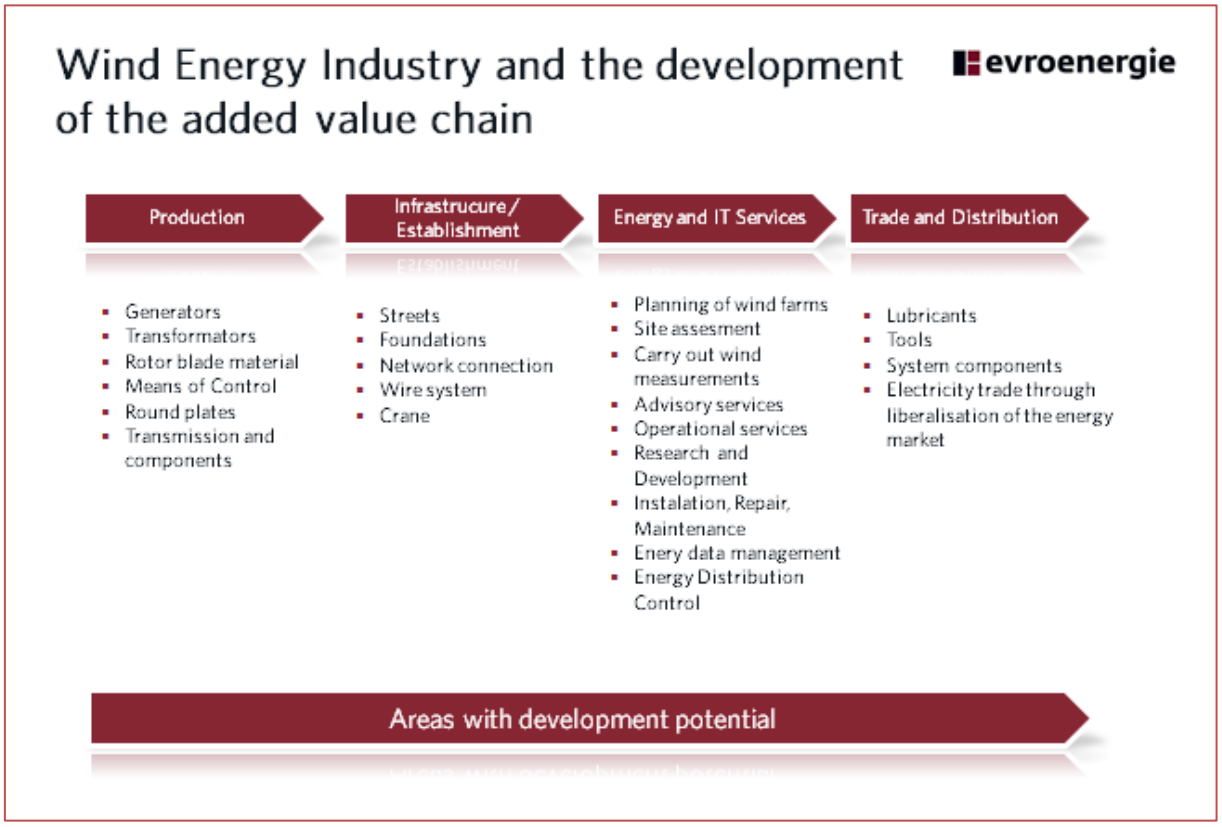


Figure 16: Sectors with long term development potential along the added value chain
Source: *(evroenergie L.L.C, 2012)*

Some of the sectors in the figure below were considered as feasible in the short and the medium term. In the medium terms, with the investment from foreign investors, and in consultation and cooperation with the wind turbine producers, towers and blades for a wind turbine could be produced in Kosovo, for the region. After the market analysis in Kosovo was carried out, no companies could be found, that are in possession of a crane to produce wind turbines. However, there are a variety of companies in the construction sector, which could be adapted very quickly and establish themselves in the newly developing market. On the short term, could cement companies, and in Kosovo there is a sufficient number of such companies, focus on the construction of fundaments. The service industry respectively the energy and IT sector that would arise from the construction of wind energy would in the short term, have the opportunity to establish themselves in the new market. What steps should be taken to achieve these objectives are described below.

According to the European statistics and many wind energy studies in the wind energy industry, employees are classified as highly qualified personnel.

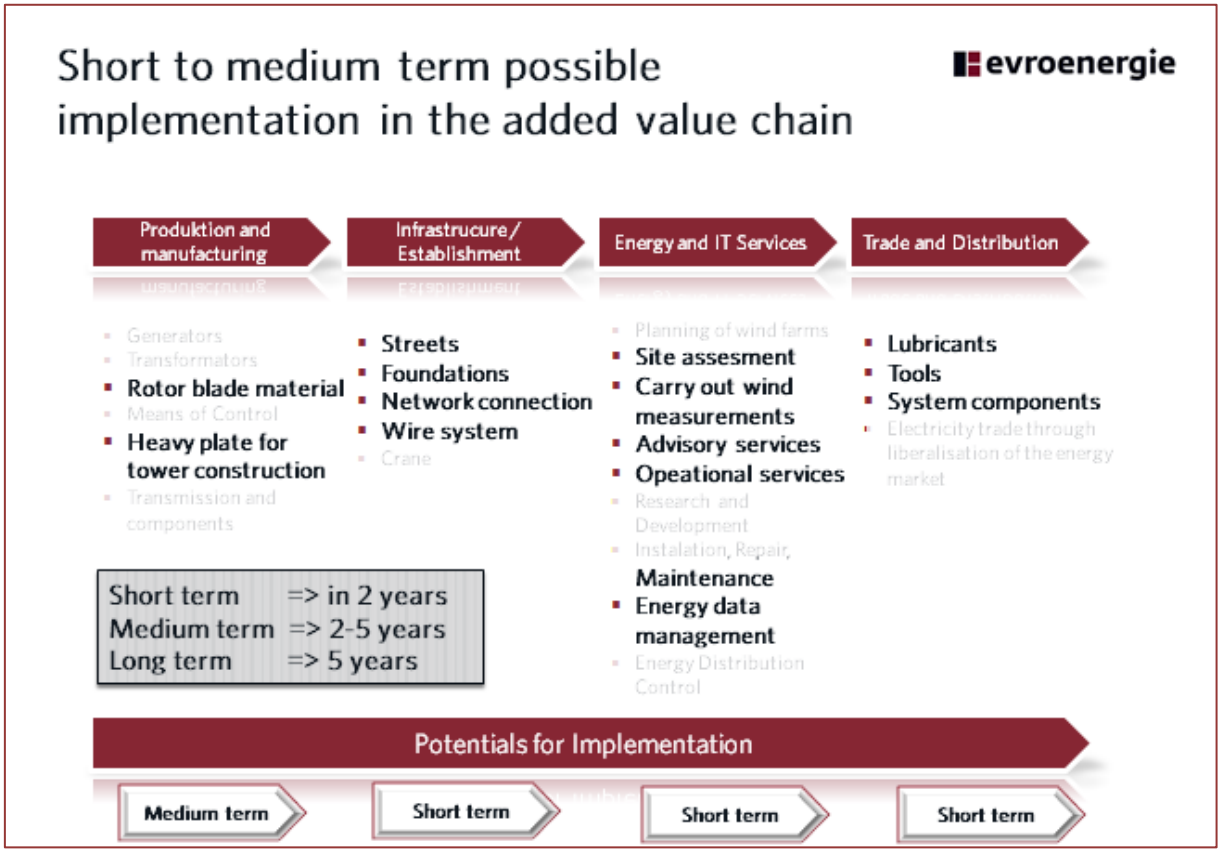


Figure 17: Short to medium-term implementation in the sectors along the added value chain
Source: *(evroenergie L.L.C, 2012)*

The IT industry in the energy industry is gaining more and more on importance. Alone in the IT industry, through the expansion of renewable energy, new areas will be created. The separation of the previous market roles in energy generation, marketing, logistics and usage, is a challenge that can be met only by means of information technology. Existing areas within the IT energy sector must be separated. Accordingly, the changes are represented as follows:

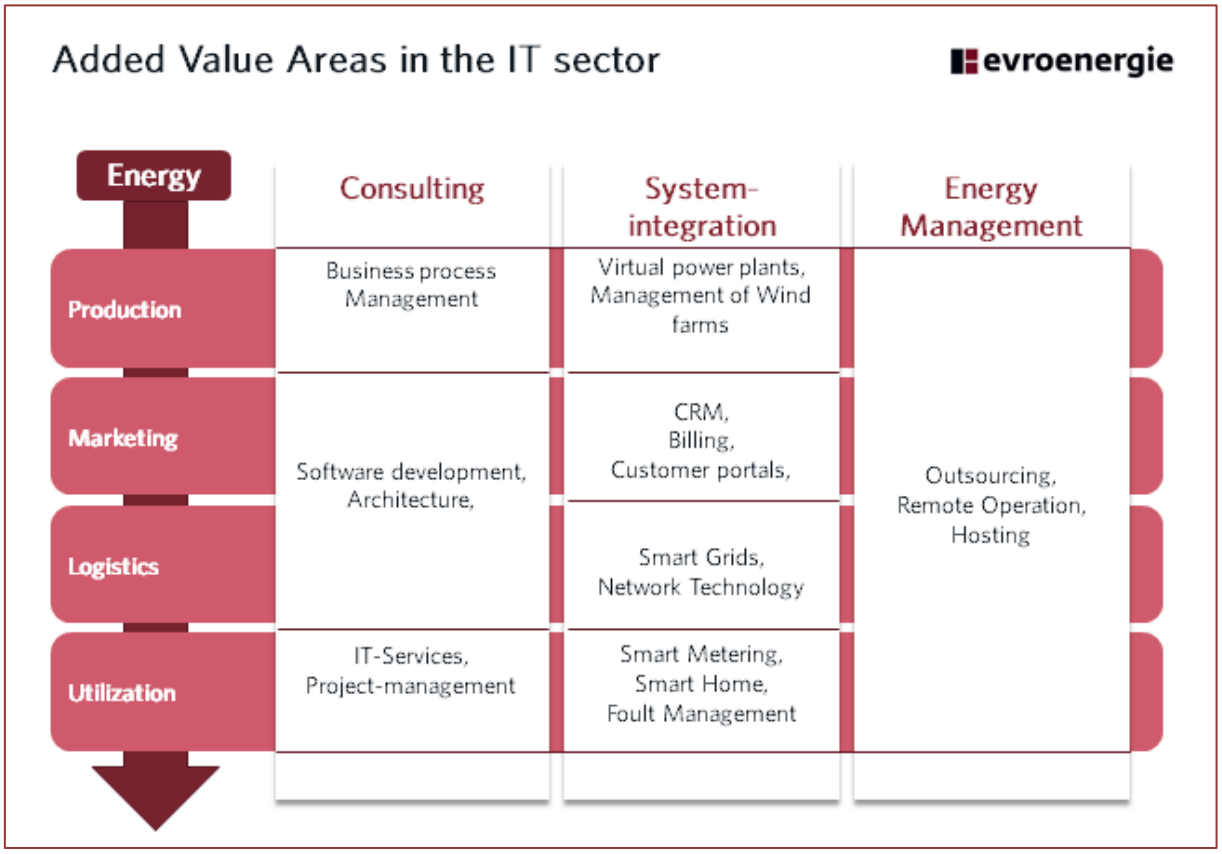


Figure 18: New added value areas in IT sector

Source: *(evroenergie L.L.C, 2012)*

The changes shown in the chart above reach to the Balkans. Kosovo would have a real chance to offer services in the areas of energy management systems and IT services. Opportunities such as outsourcing via remote operation are simple and inexpensive, without compromising the quality. As it can be seen, there are already tasks to be implemented in the IT industry for the Balkan region and the rest of the EU countries.

5.2 Wind Turbines and their Components

The use of wind power has been known for centuries. Whereas previously, the mechanical energy of the wind turbines was used directly, this energy is now mostly converted into electrical energy. A today's modern wind turbine is usually equipped with a horizontal axes rotor. The wind hits the rotor-blades which absorb the kinetic energy of the wind and convert it into rotational energy. The generator, which is

located in the nacelle, converts the rotational energy into electrical energy. A modern wind turbine can generate from the wind up to 50% of its kinetic energy.

In order for the wind turbine to optimally soak up the wind, depending on wind resources, the pitch angle of the blades can be adjusted in modern wind turbines. This allows the system to convert the kinetic energy of wind more efficiently into rotational energy. Today, usually wind turbines of a capacity of 2 to 3 megawatts are constructed. Such a wind turbine is usually a hub height of about 100 meters.

A wind turbine consists usually of the following components:

1. The Gondola

The technical components in the Gondola are to convert the rotational energy into electrical energy.

2. The Tower

With an increasing tower height, usually the wind speed increases at hub height. The tower is usually made of steel. Depending on the plant type, hybrid towers made of concrete or steel are available. The tower consists of the lower part, made of concrete and the upper part made of steel.

3. The Rotor blade

The rotor blades take on the kinetic energy of the wind and convert it into rotational energy. Today's rotor blades are usually made of fiberglass or carbon fiber combination.

4. The Hub

The hub holds the blades together. Moreover there is a mechanism located in the hub to adjust the angle of the rotor blades.

5. The Rotor shaft

The rotor shaft connects the hub to the transmission. It transmits the rotational energy of the rotor to the transmission.

6. Rotor brake

The rotor brake stops the rotor in the case of an emergency shutdown.

7. The Gear

The gear transmits the rotational energy of the low speed shaft (primary shaft) to a faster rotating shaft (secondary shaft). This allows the generator to operate optimally.

8. The Generator

The generator converts the rotational energy of the secondary shaft to electrical energy.

9. The Transformers group

The transformer group converts the low output voltage of the generator into a higher voltage, in the range of 15-30 kilovolts. This tension is well suited for the transport of electricity over short and medium distances. The output frequency of the generator is also matched to the frequency of the local network (50 Hz).

10. The Anemometer

The anemometer measures the wind speed during the operation. Since the wind measurement is made behind the rotor, the measured wind speed does not correspond with the actual wind speed in front of the wind turbine. *(http://www.energieroute.de/)*.

5.3 Transport Costs of a Wind Turbine

Prices for wind turbines and thus the production of electricity from wind dropped significantly in the recent years. This is due to the production of a larger number of them, as well as the optimized production processes and the more efficient investment techniques. The price for the construction of a wind turbine, including installation and setup, is calculated by the installed power in kilowatts. In the early 90s, the price of a kilowatt was still Euro 1.260. Until 2004, the price dropped nearly

to a third, which was 890 Euros per kilowatt. Hence a system, with a megawatt installed capacity, costs accordingly 890.000 Euro.

Meanwhile, the prices for the construction of a wind turbine dropped even more. The cost for the construction, including installation and commissioning is between 600 and 870 Euros per kilowatt of installed capacity. However, this applies only for investments between 100 and 1,000 kW. For larger plants, the prices are currently between 770 and 1030 Euros per kW. *(http://www.brennstoffzellen-heiztechnik.de)*.

The NEK Zatriq Company *(NEK Umwelttechnik AG, 2012)* could be taken as an example. In the study of NEK Zatriq the investment costs for the purchase of 15 wind turbines, with an individual capacity of 2 MW, were calculated at approximately 33 million Euros. If the cost is divided by the number of plants, the price per unit is 2.1 million Euros. In all previous wind studies, that were carried out for the Austrian and German wind energy market, high transport costs were avoided and bulky devices, such as towers and blades were purchased as close as possible to the wind farm. In the mentioned study the Company 'NEK Umwelttechnik' calculated the cost of transport of a wind turbine from Spain to Kosovo. The transportation costs for a wind turbine go up to around 127,000 Euros. Projected onto wind turbines for the identified regional potential of 4,532 MW, and assuming an installed single output of 1.5 MW, only for the transport of 3021 wind turbines would cost about 382 million Euros.

Chart 23: Transportation cost of wind turbines Spain - Kosovo

No.	Description	Number / Amount
1	WKA (15 Stk. Gamesa G97, 2 MW)	15
2	Transport Spain – Kosovo	1.000.000
3	Transportation on to site	500.000
4	Transport- and Installation Insurance	400.000
	Total cost	1.900.000

Source: Own Presentation based on the data of *(NEK Umwelttechnik AG, 2012)*

Chart 24: Total transport costs

No.	Description	Number/ amount
1	Transport cost / Wind plant	126.667
2	West Balkans Wind plants according to their potential	3.021
	Total	382.668.444

Quelle: Own Presentation based on the data of (NEK Umwelttechnik AG, 2012)

5.4 Analysis of the Components Production Potential of a Wind Power plant in Kosovo

In the context of the specific research for this study, it was found that Kosovo has no production facilities currently to produce parts of wind turbines. Nevertheless, there is already a large production in the metal processing industry in Kosovo, which would be willing to participate in such projects.

As an example, is the company, NEWCO IMK Pipes FACTORY LLC – which produces pipes and steel profiles in Ferizaj. The company is one of the largest companies in South East Europe in the manufacturing industry and in welding of steel and profile tubes.

Since its foundation in 1972 until today, more than 12,000 km of pipes for various systems of water supply, gas and oil pipelines, were produced for many different countries. The quality of the products is based on international production and inspection standards.

NEWCO IMK PIPES FACTORY L.L.C. - consists of the following three pre-production areas: spiral welding, longitudinal seam welding technology and outside layers and isolation.

The company is located in an area of about 52,000 square meters on a plot of more than 28 hectares of land in Ferizaj, south-east of Kosovo. The company owns a railway network of 3.7 km and is thus connected to the regional railway network.

After contacting the leaders of NEWCO IMK PIPES FACTORY LLC it could be noted that the company is willing to think about a possible production of components.

Below some pictures of the site can be seen.

Figure 19: Production Company EWCO IMK PIPES FACTORY L.L.C.
Source: *(ww.imk-ks.com)*

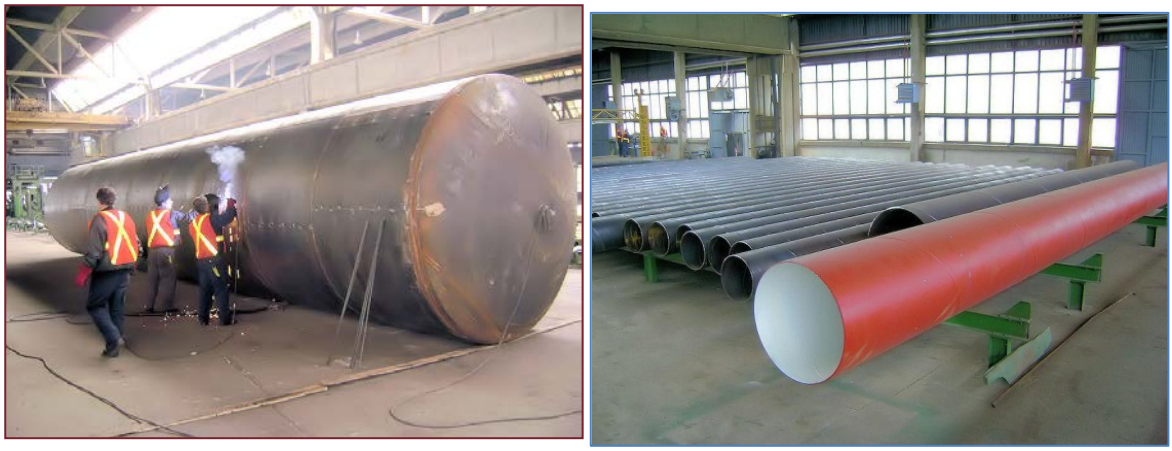


Figure 20: Production Company - facility EWCO IMK PIPES FACTORY L.L.C.

Source: *(ww.imk-ks.com)*

6 The Required Professional Qualifications and the Development of new Career fields

As analyzed in the previous chapters, Kosovo, through a clear strategy, could become a pioneer in the region in the wind energy sector. This chapter explains what exactly needs to be done to achieve these goals.

Kosovo and the region are at the beginning of a long path, called energy production from wind. Nevertheless, as explained in this study, the wind energy potential exists and must be used. It has been shown that these large-scale projects have been launched in order to use this wind potential. Up to the current point, the researched and presented countries herein do not produce any energy from wind.

The enormous wind potential and its use demand a well-trained and professional staff from the very beginning. In this study of the new developing market, new careers that would arise with the expansion of wind energy are analyzed and presented. In the Western European countries, the specific occupational areas are already built up very well.

To achieve the goal of developing new occupational fields, the relevant education authorities would have to set clear goals. The political support is necessary. Figure 19 shows what new professions, disciplines, courses and training can be built in the long term in Kosovo.

6.1 Long term implementation

The picture below presents a summary of professions, disciplines, courses and training programs that can be implemented in the long term.

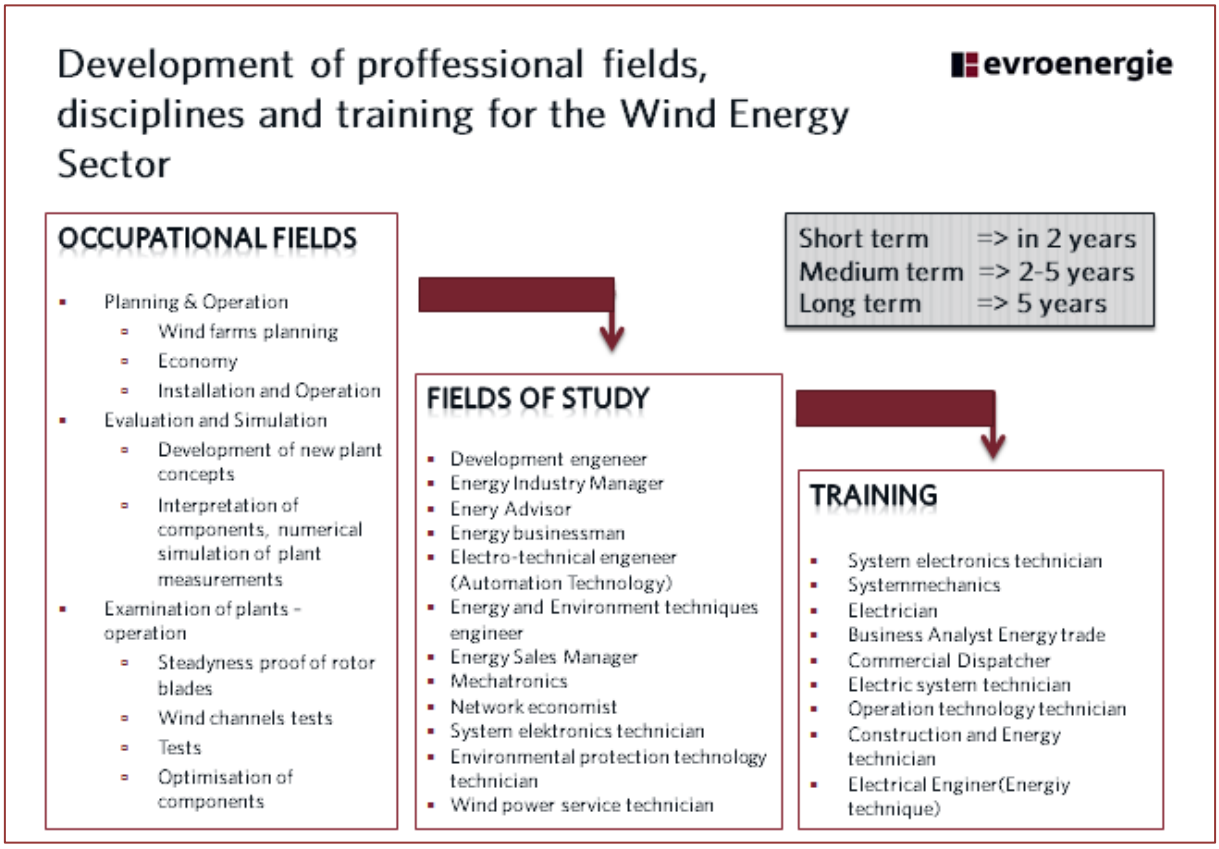


Figure 21: Development of professional fields, disciplines and training
Source: Own presentation

6.2 Short and Medium Term implementation

Furthermore, professions, disciplines and courses were analyzed, which could be set up quickly, in order to be ready for the rapid development of the energy market. In the short term, especially the necessary training fields, as training in electrical engineering is already set up in Kosovo, could be established. Also every retraining would be possible. Among the disciplines and the professional fields a medium-term implementation is classified as possible. Most disciplines are indeed new in Kosovo, however through a study of 3 to 5 years in the medium term, highly qualified personnel could be educated.

Professions, disciplines and training programs that could be implemented in the short to medium term are:

Career options (Mid Term implementation)

- Planning & Operation
    - Wind farm plans
    - Economy
    - Installation and operation

Subject Area (Mid Term implementation)

- Energy Industry Manager
- Energy advisor
- Emery trader
- Electrical Engineer (automation)
- Energy Distribution Manager
- Mechatronics
- Network economist
- Wind power Service technician

Training (Short term implementation)

- Plant electronics technician
- Plant Mechanic
- Construction technician
- Commercial Dispatcher
- Electric plant technician
- Industrial Engineering technician
- Electronics Energy / Construction
- Electrical Engineer (Power Engineering)

Summarized, the professional fields, disciplines, courses and training are represent as follows

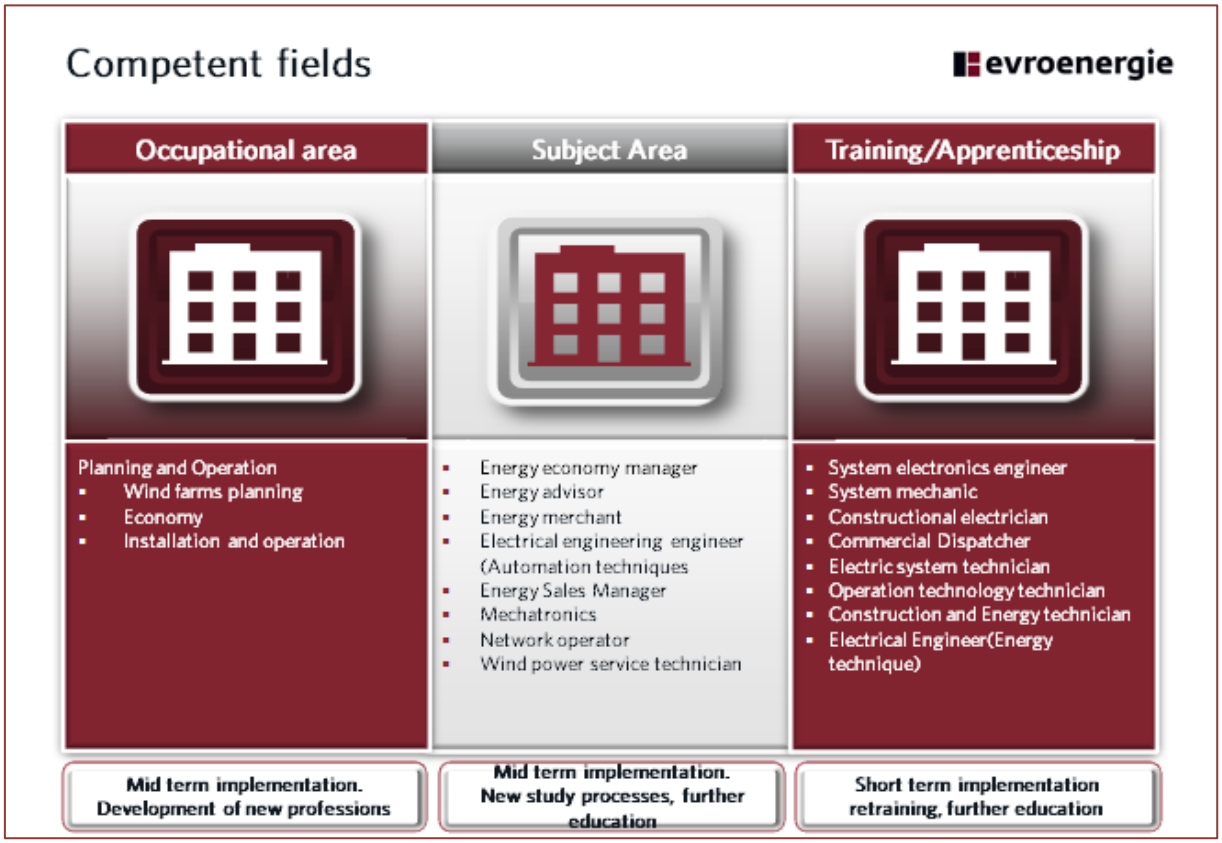


Figure 22: Short and medium term implementable
Source: Own presentation

From the professional fields and disciplines described, highly educated and specialized employees for the following business groups could emerge:

Business groups

- Wind turbines
- Producers of systems and components
- Engineering office
- Testing and certification facilities
- Research Institutes
- Wind farms
- Wind assessment experts
- Planning Bureau
- Authorities
- Operators of wind farms

- Energy suppliers, Utilities
- Banks
- Insurance
- Officers for the Energy Industry

By developing new areas of expertise, new study disciplines and training, Kosovo could expand its range of services, both in IT and in the energy industry, and also offer these services to the region.

7 Findings

The study showed that Kosovo and the other countries of the Western Balkans region posses a significant potential for wind power generation. Especially from the presented planned projects and the carried out researches, but also from the numerous interviews and the workshop held with the help of this study, the following findings are acquired.

- It was noted that the development of wind energy depends not only on the geographical conditions but also on the legal and economic conditions, tariff and promotion systems, approval cycles and also network-supply conditions
- The results on the law requirements for renewable energy presented in this study, suggest that the basics (tariffs, priority networks, etc.) are for the development of renewable energy systems in principle available. However the optimization of these is urgently needed
- It was noted that the approval process is complicated, time consuming and not yet fully developed in practice
- The documents for permit application for the construction and operation of new capabilities are very general in nature, and can lead to ambiguity of the relevant institutions as well as of applicants
- Based on the order of the specified points in the entry form, the applicants face enormous expenses, even if the applicant does not receive a license ultimately
- Through the expansion of wind power generation, great opportunities to create new added value chains are available in Kosovo
- Through the services in the energy and IT industry and also metal processing industry, Kosovo could become a leader in the Balkans
- In the medium term, Kosovo could become the export country for wind turbine components in the Balkan region
- By the development of new areas of expertise, new competence areas and training, Kosovo could offer its services not only nationally, but also in the rest of the Balkan region, in the IT and energy industry.

8 Recommendations

The findings from the previously listed below recommendations, for the way forward in the context of wind power generation, are presented. In this case, recommendations for the government on one side and on the other side for institutions and the private sector, as well as for GIZ are presented. The described recommendations arise from the conclusions drawn by 'evroenergie' and also comply with the researches related to the construction procedures of wind energy production in other countries.

Recommendations for the public sector

- The first and the unavoidable step, is to create a Wind Atlas with the respective wind corridors. This is how the Kosovo government could offer potential investors basic information for the expansion of wind potential. This step would reduce the time consumption for the implementation of a possible project
- During the drafting of a Wind Atlas, as a second step, the plans on land and land use plans should be underlined, in order to make it clear, where wind farms should be built or prohibited for various reasons
- The drafting of a strategy for the promotion of new added value chains in the IT, the energy and metal industries.
- Definition of educational strategies in IT, metal and energy sectors, in cooperation with the private sector
- Implement plans for the new professions
- Abolition of customs tariffs for the import of raw materials for the production of wind turbine components
- Strategy development for the delivery of services in neighboring countries
- Simplify licensing procedures for wind energy production and the establishment of clear procedures for the acquisition of licenses
- For the different types of renewable energy sources, various authorization forms for the construction and operation should be available, as the specific types of renewable energy must fulfill different requirements

- Establishment of a competence center for information related to the methods and forms for the coordination of the institutions involved in Kosovo; the implementation should be in everyone's interest starting from the permit application and up to real project implementation. Kosovo should develop itself to a pioneer in the region.
- Analysis and review of technical options available in relation to the connection of renewable energy into the electricity network

Recommendations for the Private Sector

- Establish a joint venture between local and foreign companies to produce wind turbines components
- Partnership development between banks and other financial institutions with the aim to trigger foreign investment
- Develop an investment model in the field of renewable energy

Recommendations for the Association for International Cooperation – GIZ

- The establishment of a competence centre for information related to wind energy and further pursuit of the potentials in Kosovo
- Assist in the drafting procedure of a Wind Atlas for potential investors
- Establish a support system for the creation of areas of expertise in the field of renewable energy in Kosovo
- Establish trainings, to meet the requirements of the EU and the necessary areas of expertise
- Detailed analysis of the possibility for the production of farms components in Kosovo
    - Establish Business Case
    - Establish an Information Platform
    - Implementation and accompaniment of informational events
- Create a platform for discussions for the establishment of a joint venture between local and foreign companies

Appendix 1: EU Companies active in the Wind Energy Industry

Chart 25: International presence of EU companies in the wind energy industry

No.	Company	International Presence	
		European Union	others
1	2EN SA	Greece	-
2	4C Offshore Limited	United Kingdom	-
3	A. Silva Matos – Energia, SA	Hungary, Portugal, Romania, Spain	United States of America
4	A2SEA A/S	Denmark, Germany, United Kingdom	-
5	ABB	European Union	Africa and Asia, India, Middle East, North America, South America
6	ABO Wind AG	Belgium, Bulgaria, France, Germany, Ireland, Spain, United Kingdom	Argentina
7	AC Prim Sp.zo.o	Poland	-
8	Acciona Energia, SA	France, Germany, Greece, Hungary, Italy, Portugal, Spain	Australia, Canada, Chile, China, India, Mexico, Morocco, South Korea, United States of America
9	Actifl ow BV	Belgium, Netherlands	-
10	Advanced Offshore Solutions ApS	Denmark	-
11	Advantech Europe GmbH	Netherlands	Brazil, China, Israel, Japan, Korea, Singapore, Thailand, Turkey, United States of America
12	AdVentum	Italy	-
13	AES Wind Generation, Europe	Bulgaria, Czech Republic, France, Hungary, Netherlands, Spain, United Kingdom	Asia, Cameroon, Kazakhstan, Mexico, Middle East, Nigeria, South America, Turkey, Ukraine, United States of America
14	AGY	France	China, Japan, Korea, United States of America
15	Aioliki Kilindrias SA	Greece	-

16	Aiolis Energy Investments Ltd	Greece	-
17	Air energy	Belgium, United Kingdom	Asia-Pacific, Australia, Middle East, United States of America
18	Al-Andalus Wind Power SL	Spain	-
19	Alnmaritec Ltd.	Belgium, Cyprus, Germany, Greece, Italy, Luxembourg, Netherlands, Portugal, United Kingdom	Algeria, Australia, Barbados, Indonesia, Israel, Kuwait, Malaysia, Norway, Pakistan, Singapore, Venezuela
20	Alpha Wind SRL	Ireland, Denmark, Poland, Romania, United Kingdom,	Egypt, Norway, United States of America
21	Alstom Wind	Belgium, Germany, Greece, Hungary, Ireland, Italy, Netherlands, Portugal, Spain, United Kingdom	Asia, Australia, Indonesia, Middle East, Nigeria, North Africa, North America, Panama, Russia, South Africa, South America, Turkey
22	Altahullion Wind Farm Limited	Ireland, United Kingdom	-
23	Alushipp Technology Ltd.	Poland	-
24	Ammonit Measurement GmbH	Austria, Czech Republic, France, Germany, Italy, Portugal, Spain	Australia, China, North America, Russia, South Africa, South America
25	AOS Sp. z o.o.	Poland	-
26	Aplicaciones de Energías Sustitutivas	Greece, Spain	Colombia
27	AQSystem	Finland, Italy, Spain, Sweden, United Kingdom	Canada
28	ArcelorMittal Ringmill	Belgium	-
29	Ardrossan Wind Farm Limited (Scotland)	United Kingdom	-
30	AREVA – Renewable Energies Business Group	France	-
31	Arise Windpower AB	Sweden	-
32	Aristoncavi SpA	Italy	China, Dubai, Singapore
33	ASJA Ambiente Italia SpA	Italy	Argentina, Brazil, China
34	Atlas Magnetics Group	Germany, Netherlands	Canada, China, United States of America
35	ATM-PRO SPRL	Belgium	-
36	Availon GmbH	Germany, Italy, Spain	United States of America
37	Avancos	Germany, Netherlands, Spain, United	China, India, United States of America

		Kingdom	
38	Avanti Wind Systems A/S	Denmark, Germany, Spain, United Kingdom	Australia, China, India, South Korea, United States of America
39	Avantis Europe GmbH	Germany	Australia, Hong Kong
40	AVL List GmbH	Austria, Benelux, Czech Republic, Finland, France, Germany Hungary, Italy, Poland, Portugal, Romania, Slovenia, Spain, United Kingdom	Argentina, Asia, Australia, Brazil, Croatia, North America, Russia, Scandinavia, Switzerland, Turkey
41	AWS Truepower	Spain	India, United States of America
42	Axis Renewables	Ireland, United Kingdom	Bermuda, Switzerland, United States of America
43	Bachmann electronic GmbH	Austria, Denmark, Germany, Netherlands	China, India
44	Bakker Magnetics BV	Belgium, Netherlands	-
45	Ballast Nedam Offshore	Netherlands	-
46	Baltic Wind Park	Latvia	-
47	BARD Engineering GmbH	Germany	-
48	Barlovento Recursos Naturales SL	Romania, Spain	Brazil, Peru
49	Barrow Offshore Wind Limited	United Kingdom	-
50	BBB Umwelttechnik GmbH	Germany	-
51	Beaufort Wind Limited	United Kingdom	-
52	BEN Aketil Wind Energy Limited	United Kingdom	-
53	BerlinWind GmbH Germany	Germany	-
54	Beten International	France	Kazakhstan, Russia, Ukraine
55	Bicker FEN Windfarm Limited	United Kingdom	-
56	Bilbster Wind Farm Limited	United Kingdom	-
57	Blue H Technologies BV	Cyprus, Italy, Netherlands, United Kingdom	-
58	Bonfi glioli Riduttori SpA	France, Germany, Italy, Spain, United Kingdom	Australia, Canada, India, South Africa
59	Bonorva Windenergy S.R.L.	Italy	-
60	Boryszewo Wind Invest Sp. z o.o.	Poland	-
61	BTI Light Systems A/S	Denmark	-

62	Bulgarian Power EOOD	Bulgaria	-
63	Bureau Waardenburg bv	Netherlands	-
64	Cambrian Wind Energy Limited	United Kingdom	-
65	Capital Safety Group Limited	Sweden, United Kingdom	Asia, Australia, Canada, Latin America, United States of America
66	Carlisle Industrial Brake & Friction	Netherlands, United Kingdom	China, India, Japan, United States of America
67	Cathie Associates SA/NV	Belgium, France, United Kingdom	-
68	Causeymire Windfarm Limited	United Kingdom	-
69	CD-adapco	France, Germany, Greece, Italy, Netherlands, United Kingdom	Africa, Brazil, India, Israel, Japan, Korea, Russia, Singapore, United States of America
70	Cenaero	Belgium, France	
71	CEZ Obnovitelne zdroje sro	Czech Republic, Germany, Hungary, Netherlands, Poland, Romania	Albania, Serbia
72	CG Power Systems Belgium NV	Belgium, France, Germany, Hungary, Ireland, Netherlands, Sweden, United Kingdom	Canada, China, Curacao, India, Indonesia, United States of America
73	Chapin International LLC	France	United States of America
74	Clipper Windpower Europe Limited	United Kingdom	United States of America
75	Cockerill Forges & Ringmill	Belgium	-
76	Community Windpower Limited	United Kingdom	-
77	Consolidated Contractors International Company SAL	Greece, Italy, United Kingdom	Africa, Malaysia, Middle East, United States of America
78	Continental Wind Project Management SRL	Romania	-
79	Converteam UK Ltd	Austria, Denmark, France, Germany, Italy, United Kingdom	Brazil, Canada, China, India, Norway, Russia, Singapore, South Korea, United Arab Emirates, United States of America

80	CONWX Aps	Denmark	-
81	Coöperatieve Vereniging tot Collectief Bezit van Windmolens "De Windvogel" BA	Netherlands	-
82	Corrosion & Water-Control BV	Cyprus, Denmark, Finland, France, Germany, Greece, Italy, Netherlands, Spain, United Kingdom	China, Iceland, India, Iran, Norway, Singapore, South Korea, Taiwan, Turkey, Ukraine, United Arab Emirates, Vietnam
83	C-Power NV	Belgium	-
84	Cresto A/S	Denmark, Sweden	-
85	Crockagarran Wind Farm Ltd	United Kingdom	-
86	Croon Elektrotechniek BV	Netherlands, Poland	-
87	CUE DEE AB	Sweden	-
88	Cummins Generator Technologies Ltd	Austria, Germany, Italy, United Kingdom	Canada, China
89	Dalry Community Wind Company Limited	United Kingdom	-
90	Danish Wind Investment A/S	Denmark	-
91	Daunia Wind S.R.L.	Italy	-
92	Davi – Promau SRL	Italy	Australia, Brazil, China, India, Norway, South Africa, United States of America
93	David Brown Gear Systems Limited	France, United Kingdom	Australia, Brazil, Chile, China, India, Indonesia, South Africa, United States of America
94	dB Vib Groupe	France	-
95	DDIS	France	-
96	Delta Energy Systems (Germany) GmbH	Czech Republic, Finland, France, Germany, Italy, Netherlands, Poland, Romania, Slovakia, Spain, Sweden, United Kingdom	Australia, Brazil, China, India, Japan, Russia, Singapore, Switzerland, Thailand, United States of America
97	Deutsche WindGuard Offshore GmbH	Germany	-

98	DEWI GmbH – Deutsches Windenergie-Institut	France, Germany, Italy, Spain	Brazil, Canada, China, Turkey
99	DeWind Europe GmbH	Germany	Canada, South Korea, United States of America
100	DEWI-OCC Offshore and Certification Centre GmbH	Germany	-
101	Dexia	Belgium, France, Luxembourg	Turkey
102	DHI	Bulgaria, Czech Republic, Denmark, France, Germany, Hungary, Italy, Poland, Portugal, Romania, Slovak Republic, Spain, Sweden	Australia, Brazil, Canada, China, India, Malaysia, New Zealand, Norway, Singapore, South Africa
103	DHL Global Forwarding (Sweden) AB	European Union	Africa, Asia, North America, Oceania, South America
104	DIgSILENT GmbH	Germany	-
105	DONG Energy A/S	Denmark, France, Germany, Netherlands, Poland, Sweden, United Kingdom	Norway
106	Doosan Power Systems	Czech Republic, Germany, United Kingdom	United States of America
107	Draka	European Union	Asia-Pacifi c, Canada, Central America, Mexico, South America, United States of America
108	DST - Wind, S.A.	Portugal	
109	Du Pont Iberica, SL	European Union	Asia-Pacifi c, Canada, Central America, Mexico, South America, United States of America
110	Dummuies Windfarm Huntly Limited	United Kingdom	-
111	E.ON Climate & Renewables GmbH	Germany, Italy, Spain, Sweden, United Kingdom	United States of America
112	EarthStream	France, Germany, Poland, Spain, United Kingdom	Brazil China, Dubai, Malaysia, Singapore, South Africa, United States of America, Vietnam

113	Eco - Wind Construction S.A.	Poland	-
114	ECO Wind Power Limited	Ireland	-
115	Ecofys	Germany, Netherlands, United Kingdom	China, United States of America
116	E-Connection Project B.V.	Netherlands	-
117	EDF ENERGIES NOUVELLES	France	Canada, United States of America
118	EDP Renováveis	Belgium, France, Italy, Portugal, Romania, Spain, United Kingdom	Brazil, Canada, United States of America
119	Eesti Energia A/S	Estonia	-
120	Eickhoff Wind Power GmbH	Bulgaria, Germany, Poland, United Kingdom	Australia, Belarus, China, Russia, South Africa, United States of America
121	Electrawinds Evolis Wind	Belgium	-
122	Eléna Energie	France	-
123	Eleon A/S	Estonia	-
124	Elos Fixturlaser AB	Germany, Netherlands, Sweden	Australia, Brazil, Canada, China, Russia, Taiwan, United States of America
125	EMD International A/S	Denmark, France, Germany, Spain, United Kingdom	Canada, Middle East, Norway, United States of America
126	EMEK SA	Bulgaria, Greece	-
127	Emerging Energy Research	Spain	Singapore, United States of America
128	EMU Limited	United Kingdom	Middle East, North Africa
129	EnBW Erneuerbare Energien GmbH	Germany	-
130	ENCIS ENERGIES VERTES	France	-
131	Eneco Wind BV	Netherlands	-
132	Enel Green Power	France, Greece, Italy, Portugal, Romania, Slovakia, Spain	Latin America, North America, Russia
133	Enercon GmbH	Austria, Belgium, Denmark, France, Germany, Greece, Italy, Netherlands, Portugal, Spain, Sweden	Argentina, Brazil, Canada, Turkey
134	Energiekontor AG	Germany, Portugal, United Kingdom	-
135	ENERGOTECH SA	Greece	-

136	Energy Competence Centre GmbH	Germany	-
137	Energy Research Centre of the Netherlands ECN	Netherlands	-
138	Enerpac BV	Austria, Belgium, Denmark, France, Germany, Greece, Iceland, Ireland, Netherlands, Portugal, Spain, Sweden, United Kingdom	Australia, Brazil, Canada, China, India, Japan, Latin America, Middle East, New Zealand, North Africa, Norway, Russia, Singapore, South Africa, South Korea, United States of America
139	Enertec	Greece	-
140	EnerVest AG	Belgium, Germany	-
141	Enfinity	Belgium, Czech Republic, France, Italy, United Kingdom	Brazil, Canada, China, India, Israel, United States of America
142	Engy AB	Luxembourg, Sweden	-
143	Enolia Ventus SA	Greece	-
144	ENSPEC Power Limited	United Kingdom	-
145	Ensto Finland Oy	European Union	-
146	Environmental Protection Engineering S.A	Greece	-
147	Eolfi	France, Greece, Poland	United States of America
148	Eolia Renovables	France, Germany, Poland, Portugal, Spain	Canada, Mexico
149	EP Global Energy Ltd	Cyprus, Greece, Romania	Albania, United Arab Emirates
150	EPA	Poland	-
151	Equipaggiamenti Elettronici Industriali – EEI SRL	Italy	-
152	Erasmus University College	Belgium	-
153	ERM – Environmental Resources Management	Austria, Belgium, France, Germany, Hungary, Italy, Poland, Portugal, Spain, Sweden, United Kingdom	Argentina, Brazil, Canada, China, Colombia, Hong Kong, India, Indonesia, Japan, Kazakhstan, Korea, Malaysia, Mexico, New Zealand, Panama, Peru, Puerto Rico, Russia, Singapore, South Africa, Taiwan,

			Thailand, United Arab Emirates, United States of America, Vietnam
154	ESK Ceramics GmbH & Co KG	Germany	-
155	Essex Wind Farm III ApS	Denmark	-
156	ESTIA consulting & engineering SA	Greece	-
157	European Wind Farms A/S Ewp Windtower Production AB	Bulgaria, Denmark, France, Germany, Greece, Italy, Poland, Sweden	Bosnia, Croatia
158	EWT B.V. (Emergya Wind Technologies)	Netherlands, Sweden, United Kingdom	India, United States of America
159	Faccin SRL	Germany, Italy, Spain	China, United States of America
160	Falck Nutec	Denmark, Germany, Netherlands, United Kingdom	Azerbaijan, Brazil, Indonesia, Malaysia, Nigeria, Norway, Russia, Singapore, Thailand, Trinidad and Tobago, United Arab Emirates, United States of America, Vietnam
161	Fersa	Estonia, France, Italy, Poland, Spain	China, Montenegro, Panama
162	Fiberline Composites A/S	Denmark	-
163	Fibox oy Ab	European Union	Australia, Canada, China, Hong Kong, Indonesia, Israel, Japan, Korea, New Zealand, Russia, South Africa, Taiwan, United States of America
164	FLOW	Netherlands	-
165	FORCE Technology	Denmark, Sweden	China, Norway, Russia, United States of America
166	Forgital Group	Italy	-
167	ForWind – University of Oldenburg	Germany	-

168	Freudenberg Simrit GmbH & Co KG	Austria, Belgium, Denmark, Finland, France, Germany, Hungary, Italy, Poland, Portugal, Romania, Spain, Sweden, United Kingdom	Australia, Brazil, Canada, China, India, Japan, Mexico, Norway, Russia, Switzerland, Turkey, United States of America
169	Fugro Engineers BV	Netherlands	-
170	Fuhrländer AG	Bulgaria, Germany, Poland, Portugal, Spain	Azerbaijan, Brazil, China, Japan, Ukraine, United States of America, Vietnam
171	Fyns Kran Udstyr A/S	Denmark	-
172	G&G International	Belgium	-
173	Gamesa	France, Germany, Greece, Italy, Portugal, Romania, Spain, United Kingdom	China, Mexico, United States of America
174	Gaoh Offshore Limited	United Kingdom	-
175	Garrad Hassan and Partners Ltd	France, Germany, Ireland, Italy, Netherlands, Poland, Portugal, Spain, United Kingdom	Australia, Brazil, Canada, Chile, China, Egypt, India, Japan, Korea, Mexico, New Zealand, South Africa, Turkey, United States of America
176	Garves Wind Limited	United Kingdom	-
177	GDF SUEZ Europe*	does this mean EU?	Africa, Asia-Pacific, North America, South America
178	GE Energy	European Union	Africa, Asia-Pacific, North America, South America
179	GEO-NET Umweltconsulting GmbH	Germany	-
180	GeoSea NV	Belgium	Australia
181	Gerber Technology	Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Lithuania, Netherlands, Portugal, Romania, Spain, Sweden, United	Africa, Asia-Pacific, Canada, South America, United States of America

		Kingdom	
182	Gerken SA	Belgium, Finland, Italy, Poland, Spain, United Kingdom	Australia, China, Croatia, Dubai, Ecuador, India, India, Indonesia, Iran, Japan, Korea, Mexico, Morocco, Norway, Pakistan, Philippines, Singapore, South Africa, Switzerland, Thailand, Turkey, United States of America
183	Gestamp Eolica	Belgium, Bulgaria, Poland, Romania, Spain	Brazil, Turkey, United States of America
184	Gexpro Services / Rexel	France, Hungary, Italy	Chile, China, United States of America
185	Glens Of Foudland Wind Farm Limited	United Kingdom	-
186	Global Energy Services	France, Germany, Greece, Hungary, Ireland, Italy, Portugal, Spain, United Kingdom	Chile, Egypt, Mexico, Morocco, Turkey, United States of America
187	Global Marine Systems Limited	United Kingdom	China, Dubai, Singapore, United States of America
188	Global Steel Service	Latvia, Poland	-
189	Global Tech I Offshore Wind GmbH	Denmark, Germany	-
190	Global Wind Power	Bulgaria, Denmark, France, Germany, Romania	Turkey
191	Global Wind Power BV	Netherlands	-
192	Goldwind Windenergy GmbH	Germany	Australia, China, South Africa, United States of America
193	GOLIATH Wind Ltd	Estonia	-
194	Green Energy World GmbH	Germany	-
195	Green Power Development Holding Company BV	Netherlands, Poland	United States of America
196	GREEN WIND ENERGY	Denmark	-

197	Greenoge Windfarm Limited	Ireland	-
198	Grupo Apia XXI	Poland, Spain	in, Bolivia, Chile, Mexico, United States of America
199	GSG Towers	Poland	-
200	Guascor Wind	Spain	Argentina
201	GustoMSC	Netherlands	-
202	GWU-Umwelttechnik GmbH	Germany	-
203	H2air SAS	France	-
204	Hailo-Werk	Austria, Belgium, Czech Republic, Estonia, France, Germany, Greece, Italy, Luxembourg, Malta, Netherlands, Portugal, Spain	Chile, Dubai, Hong Kong, Japan, Korea, Malaysia, Norway, Singapore, Switzerland, Syria, Turkey
205	Hansen Transmissions International nv	Belgium, France, Germany, Sweden	Australia, China, India, Japan, Latin America, North Africa, North America, South Africa
206	HBM	Austria, Belgium, Denmark, Germany, Italy, Netherlands, Poland, Portugal, Spain, Sweden, United Kingdom	Asia, Australia, Latin America, Middle East, Morocco, Norway, Russia, South Africa, Switzerland, Tunisia
207	HELLENIC CABLES S.A.	Greece, Ireland, United Kingdom	-
208	Hibernian Wind Power Limited	Ireland, United Kingdom	-
209	Holmatro Industrial Equipment B.V.	Netherlands, Poland	United States of America
210	Hungarian Wind Energy Industry Association	Hungary	-
211	HydrauRent	Netherlands	-
212	I.L.M.E. S.p.A.	Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Malta, Netherlands, Portugal, Slovakia, Slovenia, Spain, Sweden, United Kingdom	Australia, Canada, Chile, China, Colombia, India, Israel, Japan, Korea, Malaysia, Mexico, Peru, Russia, Singapore, South Africa, Switzerland, Thailand, Turkey, Ukraine, United States of America, Venezuela

213	Iberdrola Renovables	France, Germany, Hungary, Italy, Poland, Portugal, Spain, United Kingdom	United States of America
214	ICPE SA	Romania	-
215	IHC EQUIPEMENTS & SERVICES	France	-
216	Impol-Inotechna d.o.o.	Slovenia	-
217	IMT BV	Belgium, Germany, Italy, Netherlands, Poland	Abu Dhabi, Dubai, Malaysia, Singapore, United Arab Emirates
218	Industrial Clutch Parts	United Kingdom	-
219	Industrie COMETTO S.p.A.	Italy	-
220	INEGI	Portugal	-
221	Inergia Spa	Italy	-
222	INFLOW	Greece	-
223	Ingeniería y Diseño Europeo SA (IDESA)	Spain	-
224	Ingeteam	Czech Republic, France, Germany, Spain	Brazil, China, Mexico, United States of America
225	Inneo Torres, S.L.	Spain	-
226	Intellifast GmbH	France, Germany, Italy, Netherlands, Spain, United Kingdom	China, Israel, Malaysia, United States of America
227	International Marine Consultancy bvba	Belgium	-
228	International Paint BV	Netherlands	Argentina, Australia, Brazil, Canada, China, Indonesia, Japan, Korea, Malaysia, Mexico, Panama, Russia, Singapore, South Africa, Taiwan, United States of America, Vietnam
229	Irish Sea Contractors	Ireland	-
230	Isolux	Italy, Portugal, Spain, United Kingdom	Algeria, Angola, Bangladesh, Gabon, Guinea, India, Jordan, Kenya, Kuwait, Latin America, Morocco, Mozambique, Oman, Qatar, Saudi Arabia,

			Syria, United States of America
231	ITW Chemical Products Scandinavia	Denmark	-
232	IVPC SRL	Italy	-
233	James Walker RotaBolt Ltd	United Kingdom	-
234	Janneniska Oy	Finland, Germany, Spain, Sweden	Norway
235	JDR Cable Systems Ltd	United Kingdom	Norway, Singapore, Thailand, United States of America
236	Jens Chr. Siig Int. Transport – Production – Wind Energy	Poland	-
237	juwi Holding AG	Bulgaria, Czech Republic, France, Germany, Greece, Italy, Poland, Spain, United Kingdom	Chile, Costa Rica, India, South Africa, United States of America
238	Karomex Invest SRL	Romania	-
239	KCI	Netherlands	-
240	KDE Energy BV	Belgium, France, Netherlands, Poland, United Kingdom	-
241	KENERSYS EUROPE GmbH	Germany	India, United States of America
242	Kintech Ingenieria S.L.	Denmark, Spain	Chile, China, United States of America
243	Kloosterboer Vlissingen V.O.F.	France, Netherlands	Canada, United States of America
244	KR Wind	Denmark, Germany, Italy, Romania, United Kingdom	Australia, Canada, United States of America
245	La Compagnie du Vent	France	-
246	Lafert SpA	France, Germany, Italy, Slovenia, Spain, United Kingdom	Australia, North America, Singapore
247	Lahmeyer International GmbH	Germany	-
248	Latchways Plc	France, Spain, United Kingdom	South Africa, United States of America
249	Leitwind SpA	European Union	Belarus, Canada, Georgia, Norway, Turkey, Ukraine, United States of America

250	Leosphere	France	Brazil, China, India, Korea, United States of America
251	LM Wind Power	Denmark, Netherlands, Poland	Canada, China, India, United States of America
252	LOGI.CO SRL	Italy	-
253	Logic Energy Ltd	Finland, France, Germany, Ireland, Italy, Poland, Spain, United Kingdom	Australia, India, Japan, Malaysia, Russia, Turkey, United States of America
254	LPG Tecnicas en Extinsion de Incendios S.L.	Spain	-
255	LS Cable	France, United Kingdom	Australia, Brazil, China, Egypt, India, Indonesia, Japan, Korea, Malaysia, Russia, Singapore, South Africa, United States of America, Vietnam
256	Mac Cup AD	Bulgaria	-
257	MAINA Organi di Trasmissione S.p.A.	Italy	China
258	Mainstream Renewable Power Ltd	Germany, Ireland, United Kingdom	Canada, Chile, South Africa, United States of America
259	Mammoet Europe BV	Netherlands	Australia, Qatar, Saudi Arabia, United Arab Emirates
260	MARTIFER ENERGY SYSTEMS	Belgium, Czech Republic, France, Greece, Italy, Portugal, Slovakia, Spain, United Kingdom	United States of America
261	MCPS LTD	United Kingdom	Argentina, Brazil, China, Dubai, Singapore, United States of America
262	MCT Brattberg AB	European Union	Asia-Pacific, Canada, Central America, Mexico, South America, United States of America
263	MECAL	Netherlands	Japan, United States of America

264	Mekanord	Denmark, France, Greece, Ireland, Italy, Netherlands, Spain, United Kingdom	Argentina, Brazil, China, Croatia, Indonesia, Malaysia, Peru, Russia, Singapore, South Africa, Turkey, United Arab Emirates
265	MENCK GmbH	France, Germany, Netherlands	China, United States of America
266	Mercon Steel Structures BV	Netherlands	-
267	MERSEN France Amiens S.A.S.	Austria, Belgium, Denmark, Finland, France, Germany, Italy, Luxembourg, Netherlands, Spain, Sweden, United Kingdom	Australia, Brazil, Canada, China, Hong-Kong, India, Japan, Korea, Latin America, Morocco, Norway, Russia, South Africa, South East Asia, Taiwan, Turkey, United States of America
268	Mervento Oy	Finland	-
269	METEODYN	France, Spain	Argentina, Australia, China, Peru, Switzerland, United States of America
270	MeteoGroup	Austria, Belgium, France, Germany, Ireland, Italy, Netherlands, Poland, Spain, United Kingdom	Switzerland, United States of America
271	METOC PLC	United Kingdom	-
272	MGM motori elettrici SpA	Italy	-
273	Mitsubishi Power Systems Europe, Ltd	Austria, Germany, Italy, Spain, United Kingdom	Egypt, Turkey
274	MLS Intelligent Control Dynamics	Spain, United Kingdom	China, Korea, United States of America
275	MME Group	Netherlands, United Kingdom	China
276	Mobimar Ltd	Finland	-
277	momac GmbH & Co.KG	Germany	-
278	Moog	Germany, Italy, United Kingdom	Australia, China, India, Japan, United States of America
279	Morgan Carbon Europe	Belgium, Czech Republic, France, Germany, Hungary, Italy, Luxembourg,	Russia, South Africa, Switzerland, Turkey

		Netherlands, Poland, Spain, Sweden, United Kingdom	
280	Mott MacDonald	France, Hungary, Ireland, Netherlands, Poland, United Kingdom	Australia, China, India, Russia, South Africa
281	MPI Offshore Ltd	United Kingdom	-
282	Mtorres	Spain	Chile
283	Nabtesco	Germany	Japan
284	Narec	United Kingdom	-
285	Nass&Wind SAS	France	-
286	National R&D Institute for Gas Turbines – COMOTI	Romania	-
287	Natural Power Consultants Ltd	France, United Kingdom	Chile, Turkey, United States of America
288	NDE SWEDEN AB	Sweden	-
289	Nexgen	United Kingdom	-
290	Nheolis	France	-
291	Nomura International PLC	United Kingdom	-
292	Nordenergie Renewables A/S	Denmark	-
293	Nordex SE	Austria, Denmark, France, Germany, Greece, Ireland, Italy, Poland, Spain, Sweden, United Kingdom	China, Japan, Turkey, United States of America
294	Nordic Wind Solutions AB	Denmark, Sweden	-
295	NORTHERN OFFSHORE SERVICES AB	Sweden	-
296	Offshore Marine Management Ltd	Germany, United Kingdom	Dubai, Mexico, New Zealand, Thailand, United States of America
297	Offshore Solutions BV	Netherlands	-
298	Operation Management Services Ltd.	Bulgaria	-
299	OPUS MARINE GmbH	Germany	-
300	Orga Aviation BV	Netherlands	United States of America
301	Oriel Windfarm Limited	Ireland	-
302	ORMAZABAL	France, Germany, Poland, Spain	Australia, China, Latin America, Turkey
303	Osiris Marine Services Ltd	United Kingdom	-
304	Osiris Projects	United Kingdom	-
305	Outsmart BV	Germany, Netherlands	-
306	Owens Corning	Belgium	-

307	Pall Corporation	European Union	Africa, Asia-Pacific, Canada, Latin America, Middle East, Puerto Rico, United States of America
308	PCS Power Converter Solutions GmbH	Germany	-
309	Peikko Group Oy	Austria, Czech Republic, Denmark, Estonia, Finland, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Netherlands, Poland, Slovakia, Spain, Sweden, United Kingdom	Canada, China, Norway, Russia, Switzerland, Turkey, United Arab Emirates, United States of America
310	PEKKANISKA GROUP	Estonia, Finland, Latvia, Lithuania, Sweden	Russia, Ukraine
311	Pemamek Oy	Finland	-
312	Phoenix Contact GmbH & Co.KG	European Union	Asia-Pacific, Canada, Central America, Mexico, South America, United States of America
313	PM Renewables GmbH	France, Germany, Italy, Netherlands, Spain	Asia, Australia, Canada, Chile, Egypt, Nigeria, Russia, South Africa, United States of America
314	Polish Wind Energy Society in Gdansk	Poland	-
315	POWEO	France	-
316	Power Climber Wind	Belgium	United States of America
317	Power Composites Holland BV	Netherlands	-
318	Power One	Italy	United States of America
319	Power@Sea NV	Belgium	-
320	Powernet Oy	Finland, Germany, Sweden	-
321	PowerWind GmbH	Germany	-
322	PP Techniq	Denmark	-
323	PPC Renewables SA	Greece	-
324	Procovent	Germany, Sweden	-
325	PRÜFTECHNIK AG	European Union	Asia-Pacific, Canada, Central America, Mexico, South America,

			United States of America
326	PRYSMIAN Cables & Systems	France, Germany, Italy, Netherlands, Spain, United Kingdom	Australia, India, India, North America, Russia, South America, Turkey
327	Pure Energy Professionals Limited	United Kingdom	-
328	RAPID-TORC SA	Belgium	United States of America
329	RAYCAP	Germany, Greece	United States of America
330	Reichhold	Czech Republic, Finland, France, Germany, Italy, Netherlands, United Kingdom	Africa, Asia-Pacific, Brazil, Canada, India, Mexico, Middle East, Norway, Turkey, United States of America
331	Relight Energie SRL	Italy	-
332	Renewable Energy Park Newcastle	United Kingdom	-
333	Renovatio Engineering	Romania	-
334	REpower Systems AG	Belgium, France, Germany, Italy, Poland, Portugal, Spain, Sweden, United Kingdom	Australia, Canada, China, United States of America
335	RES GROUP	France, Ireland, Sweden, United Kingdom	Australia, South Africa, Turkey
336	RG Renovatio Group Limited	Austria, Bulgaria, Cyprus, Greece, Italy, Poland, Portugal, Romania	-
337	Ricardo UK Ltd	Czech Republic, Germany, Italy, United Kingdom	China, India, Japan, Korea, Russia, United States of America
338	RISOE National Laboratory, Denmark´s Technical University	Denmark	-
339	Rockwell Automation European Headquarters SA/NV	European Union	Asia-Pacific, Canada, Central America, Mexico, South America, United States of America
340	Romanian Association of Wind Power Developers (APEER)	Romania	-
341	Romanian Wind Energy Association (RWEA)	Romania	-

342	Romax Technology Ltd	France, United Kingdom	China, India, Japan, South Korea, United States of America
343	Roxtec International AB	European Union	Asia-Pacific, Canada, Central America, Mexico, South America, United States of America
344	RWE Innogy GmbH	Germany	-
345	S&C Electric Europe Ltd	United Kingdom	United States of America
346	SABE di Sala Pasquale SRL	Italy	-
347	Safety SAS	France, Germany, Italy, Spain	China
348	SAMTECH	Belgium, France, Germany, Italy, Spain, United Kingdom	China, Japan
349	Sandvik A/S	European Union	Africa, Asia-Pacific, Canada, Central America, Mexico, South America, United States of America
350	Saorgus Energy Ltd	Ireland	-
351	Sapa Profiler A/S	Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Italy, Latvia, Lithuania, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom	Bosnia, Canada, China, Croatia, Mexico, Norway, Switzerland, United States of America, Vietnam
352	Savino del Bene Global Logistics and Forwarding Company	Bulgaria, France, Germany, Italy, Poland, Portugal, Slovenia, Spain, United Kingdom	Argentina, Australia, Bosnia, Brazil, Canada, Chile, China, Colombia, Costa Rica, Croatia, El Salvador, Ghana, India, Indonesia, Japan, Libya, Malaysia, Mexico, Montenegro, Nicaragua, Panama, Peru, Russia, Serbia, Singapore, South Africa, South Korea, Switzerland, Thailand, Turkey,

			Ukraine, United States of America, Uruguay, Venezuela, Vietnam
353	SC CONTINENTAL WIND RO SRL	Bulgaria, Poland, Romania, United Kingdom	Croatia, Monaco, Serbia, United States of America
354	Schneider Electric SA	European Union, France	Africa, Asia-Pacific, Canada, Central America, Mexico, South America, United States of America
355	Schuler Pressen GmbH & Co.KG	France, Germany, Italy, Poland, Slovakia, Spain, United Kingdom	Brazil, China, India, Mexico, United States of America
356	Schunk Electrographite SAS	European Union	Africa, Asia-Pacific, Canada, Central America, Mexico, South America, United States of America
357	Scintec AG	Germany	
358	SEaB Energy Ltd	France, United Kingdom	South Africa, United States of America
359	SeaCom Digitale Mess- und Übertragungssysteme GmbH	Germany	-
360	SeaEnergy Renewables Limited	United Kingdom	-
361	Seajacks UK Ltd	United Kingdom	Bermuda
362	Seaports of Niedersachsen GmbH	Germany	-
363	SEAS-NVE AmbA	Denmark	-
364	SeaZip Offshore Service B.V.	Netherlands	-
365	Senergy Alternative Energy	United Kingdom	Australia, Indonesia, Malaysia, New Zealand, Norway, United Arab Emirates, United States of America
366	SET Sustainable Energy Technologies GmbH	Austria	-
367	Shepherd Offshore Limited	United Kingdom	-

368	SICME MOTORI SRL	Austria, Belgium, Czech Republic, France, Germany, Greece, Italy, Netherlands, Poland, Slovakia, Spain, Sweden, United Kingdom	Africa, Asia, Australia, Canada, Mexico, Russia, Turkey, United States of America
369	Siemens Wind Power A/S	Denmark, Finland, Germany, Netherlands	Brazil, Colombia, Ecuador, Mexico, Peru, United States of America, Venezuela
370	SKF	Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Iceland, Italy, Latvia, Netherlands, Poland, Portugal, Romania, Spain, Sweden, United Kingdom	Africa, Asia-Pacific, Canada, Central America, Mexico, South America, United States of America
371	Smalley Europe	France, Sweden	Panama, United States of America
372	Smulders Groep	Netherlands	-
373	Solent Composite Systems Ltd	United Kingdom	-
374	SPERIAN PROTECTION EUROPE	Czech Republic, France, Germany, Hungary, Italy, Poland, Slovakia, United Kingdom	Brazil, Canada, Norway, Russia, United States of America
375	SPX Hydraulic Technologies	Finland, France, Germany, Italy, Netherlands, Spain, United Kingdom	Australia, Canada, China, India, Indonesia, Malaysia, Norway, Philippines, Singapore, South Africa, Sri Lanka, Switzerland, Taiwan, Thailand, United States of America, Vietnam
376	SSE Renewables	Ireland, Netherlands, Sweden, United Kingdom	-
377	STE GLOBAL	France, Spain	-
378	Stork Gears & Services	Belgium, Germany, Italy, Netherlands	Mexico, Singapore, United Arab, Emirates

379	Stromag France	European Union	Australia, Canada, Chile, China, Egypt, India, Korea, Mauritania, Morocco, Singapore, South Africa, Thailand, United States of America
380	STX Windpower BV	Netherlands	-
381	Subocean Group	United Kingdom	-
382	Svendborg Brakes A/S	Czech Republic, Denmark, Germany, Poland, Spain	Australia, Brazil, Chile, China, Korea, South Africa, United States of America
383	Sword CTSpace	France, Germany, United Kingdom	United Arab Emirates, United States of America
384	Taiga Mistral SL	Poland, Spain	-
385	Team Humber Marine Alliance	United Kingdom	-
386	Technip Offshore Wind Ltd	European Union	Africa, Asia-Pacific, North America, South America
387	Tekmar Energy Ltd	United Kingdom	-
388	Tele-Fonika Kable Sp.z.o.o.S.K.A	European Union	Africa, China, North and South America, Serbia, Turkey, Ukraine
389	Telvent	Portugal, Spain, Sweden	Argentina, Australia, Brazil, Canada, Chile, China, Libya, Mexico, Peru, Qatar, Switzerland, Thailand, Turkey, United Arab Emirates, United States of America, Uruguay, Venezuela
390	Tensar International Ltd	European Union	Africa, Asia, Central and South America, North America
391	TER Tecno Elettrica Ravasi S.R.L.	European Union	Australia, Canada, China, Malaysia, Turkey, United States of America
392	The Switch	Denmark, Finland, Germany, Spain	China, India, Korea, United States of America
393	THEOLIA	France	
394	Total Wind A/S	Denmark, France, Germany, Netherlands, Poland, Spain	Brazil, Canada, Morocco

395	Tractebel Engineering	Belgium, Czech Republic, France, Italy, Poland, Romania	Brazil, Chile, India, Panama, Thailand, Turkey, United Arab Emirates
396	Tractel Group	European Union	Angola, Asia-Pacific, Middle East, Mozambique, North America, South America
397	Trelleborg Ridderkerk BV	Netherlands, Spain	China, Russia
398	Turbowinds NV/SA	Belgium, Bulgaria, Italy, Netherlands, United Kingdom	Canada, China, Israel, United States of America
399	TV 95 Premier S.L.	Spain	-
400	Ubifrance	France	-
401	Uniline Safety Systems Ltd	United Kingdom	Australia
402	Uudenkaupungin Rautavalimo Oy	Finland	-
403	Vattenfall Wind Power AB	Belgium, Denmark, Finland, France, Germany, Netherlands, Poland, Sweden, United Kingdom	Norway
404	VDL Klima BV	Netherlands, Scandinavia, United Kingdom	Canada, Singapore, Turkey, United States of America, Vietnam
405	Ventyx	France, United Kingdom	Japan, North America, South Africa
406	Verbrugge Zeeland Terminals BV	Netherlands	Northern Europe
407	Vergnet	France, Italy, Lithuania	Australia, Caribbean islands, Chile, Eritrea, Ethiopia, Japan, Kenya, Mauritania, Nigeria, Taiwan, United States of America
408	Verlinde SA	France	-
409	Vestas Wind Systems A/S	European Union	Argentina, Australia, Brazil, Canada, Chile, China, India, Japan, Korea, Mexico, New Zealand, Singapore, South Africa, Taiwan, United States of America
410	Visser & Smit Marine Contracting	Germany, Netherlands, United	-

		Kingdom	
411	VITEC ENERGY	Finland, Sweden	Norway
412	VORTEX	Spain	-
413	Vos Prodect Innovations BV	Netherlands	-
414	WIND DIRECT SERVICES	France	-
415	Wind Energie Zirkel Hanse e. V.	Germany	-
416	WIND PROSPECT GROUP LIMITED	France, Ireland, Poland, United Kingdom	Australia, Canada, China, Singapore, South Africa, Turkey
417	WIND SERVICE SRL	Italy	-
418	Wind Site Evaluation Ltd	Ireland	-
419	WIND STARS SRL	Romania	-
420	WIND TO MARKET SA	Spain	-
421	WIND TO POWER SYSTEMS	Germany, Italy, Portugal, Spain	China
422	WIND TURBINE ENGINEERING Italy	Italy	-
423	WINDAR LOGISTICS SL	Spain	-
424	WINDAR RENOVABLES	Spain	-
425	WINDBUD SP Z.O.O.	Poland	-
426	WINDENERGY SERVICE B.V.	Netherlands	-
427	WINDER POWER LIMITED	United Kingdom	-
428	Windfair.net	Germany	-
429	Windfarm Development UAB	European Union	-
430	windhunter-serwis sp. z o.o.	Bulgaria, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Netherlands, Poland, Romania	Argentina, Chile, Costa Rica, North America
431	WINDKRAFT ALSLEBEN 1 GMBH & CO. KG	Germany, United Kingdom	-
432	WINDKRAFT SIMONSFELD BG AD	Bulgaria	-
433	WINDNOVATION Engineering Solutions	Germany	-
434	WINDPARKSERVICE GMBH	Germany, Ireland	Norway
435	WINDPOWER MONTHLY NEWS MAGAZINE A/S	Denmark, United Kingdom	-
436	WindPro (GCube Underwriting Ltd)	France, Germany, Spain, United Kingdom	Canada, China, Middle East, United States of America

437	WINDPROJEKT SP. Z O.O.	Poland	-
438	Windstar	Greece, Italy, Sweden	Latin America
439	Windtechnics SAS	Belgium, Bulgaria, France, Germany, Greece, Ireland, Italy, Poland, Romania, United Kingdom	Switzerland, Turkey
440	windtest grevenbroich gmbh	Germany	India, South Korea, United States of America
441	WINDTEST IBERICA SL	Spain	-
442	WINDVISION BELGIUM	Belgium, Cyprus, France, Netherlands	-
443	WindVision Ltd	Belgium, France	-
444	WINDVISION WINDFARM ESTINNES	Belgium	-
445	Winergy AG	Germany	China, India, United States of America
446	Winwind Ltd	Denmark, Estonia, Finland, Portugal, Sweden	India
447	WIP	Germany	-
448	WKN Windkraft Nord AG	Bulgaria, France, Germany, Italy, Poland, Sweden	South Africa, Ukraine, United States of America
449	World Wide Wind Energy SPA	Italy	-
450	World wind Sweden AB	Sweden	-
451	Worldwideworker.com BV	European Union	-
452	wpd think energy GmbH & Co KG	Bulgaria, Finland, France, Germany, Greece, Italy, Poland, Romania, Spain, Sweden	Argentina, Canada, Chile, Croatia, Panama
453	XEMC Darwind BV	Netherlands	China
454	Yorkshire Windpower Limited	United Kingdom	-
455	Zephyr Investments Limited	United Kingdom	-
456	ZF Friedrichshafen AG	European Union	Algeria, Argentina, Australia, Brazil,Canada, China, Egypt, India, Japan, Jordan, Mexico, Russia, South Africa, South East Asia, Syria, United Arab Emirates, USA

Source: *(EWEA - The European Wind Energy Association, 2012)*

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