

Wind energy development in Ukraine

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Abstract

Ukraine is a country with huge wind energy potential. And yet it remains heavily dependent on imported fuel from Russia. Despite the existing potential the development of the wind energy sector in Ukraine faces many obstacles. Lack of transparency in the market and lack of the effect regulations both have negative impact for the development of wind energy sector. Political instability and continuous support for the convenient energy source prevents wind energy development. On the other hand, as a member of European Energy Community Ukraine has to increase its share of renewable energy up to 12% by 2020. Even though the attention for the wind energy is rising nowadays, the renewable energy market is still facing huge problems in general. Most of them are related to the discrepancies in legislation. In this thesis drivers and barriers for the wind energy development in Ukraine are identified using two different frameworks: first current situation is described using the framework suggested by Johansson, S. and Jonson, A. (2000); then findings are analyzed with the help of PEST analytical tool.

Keywords: wind energy, wind, legislation, energy independency, Ukraine

Executive Summary

Based on the global energy tendency, an interest appears for the investments in the wind energy market in Ukraine. The government of Ukraine is establishing policies to promote the development of renewable energy in the country. Nevertheless discrepancies in the legislation create barriers for the development of wind energy and are likely postpone the further expansion of this sector.

Ukraine highly depends on the imported fuel which comes mainly from Russia. Facing huge energy security issue country does not have enough fuel resources to cover its energy demand (Denisenko & Pasyuk, 2010, p. 10). The imported natural gas and oil comprises about 75 % of country demand (EUROPE, 2009, p. 114).

Due to its geographical location Ukraine is very important for energy transit. The transit sector is one of the biggest revenue suppliers for the country's budget. According to the country's view, the transit could ensure the security for energy supplier. This means that Russia depends a lot on the Ukraine as well (Oecd & International Energy, 2006, p. 207).

Being a member of European Energy Community, Ukraine has to increase the share of the renewable energy. According to EU goals, energy sector must reach a 20% share of renewable energy by 2020 while Ukraine must produce 12% of renewable energy by that time (Berezovski, 2012).

The energy sector in the country contributes significantly to local air pollution. On the other hand wind, solar, hydro and other types of renewable energy provides many possibilities, such as economic development, energy dependency reduction, cleaner environment etc. for the countries and offers many environmental benefits. Renewable energy doesn't contribute to air pollution and global warming in the same extent as fossil fuel (Oecd & International Energy, 2006, pp. 346-347).

Wind energy could cover part of the country's demand. Together with other renewable energy sources it could encompass 25 % percent of total energy demand in the country. Investments in the wind energy sector might offer many benefits for the country in the long term perspective. An increasing share of the wind energy in the total electricity market would help to fight against the energy dependency.

The aim of this research was to understand what actions are required in order to ensure wind energy expansion in Ukraine. The country has a tremendous potential of wind energy, however its share in the total energy market is still insignificant, at only 0.02 %.

For the analysis the framework suggested by Jacobsson and Johnson (2000) was used to describe current situation in the wind energy sector. This framework combines actors, institutions and networks. The main actors and main responsibilities and interaction related with wind energy sector were presented. In the energy system actors depend on each other. Actors are connected through the network within the energy system. Some "prime movers" among the actors were presented. Actor's performances are related to each other and heavily depend on the institutions. In the thesis, policy and legislation are presented under the umbrella of institutions. Strict regulations and legislation are affecting their performance; however some of them are more resistant to different requirements and restrictions. Well-organized institutions have the possibility to encourage good changes.

Instability in the political arena is influencing investor's decisions. Many constraints for the wind energy development come from flawed legislation. During this research many different

barriers for the development of wind energy in Ukraine were identified. Some of them are related to new law, which defines that certain part of the project costs has to originate from Ukraine. On the other hand the law related to the “green tariff” establishment is one of the main drivers for the wind market development.

Today energy users and consumers can not change energy supplier. There are not enough competitors within the energy market which is currently monopolized. As a result some actors do not have enough sources to materialize changes. Only a few have the possibility to affect existing energy market and often those are not interested in wind energy. The lack of competitiveness in the market is blocking the improvement in the wind energy sector.

But with the wind energy deployment a challenging issue related to energy security could be solved. Further the obligation related to the European Energy Community can be fulfilled. Independency in the energy sector would help to build a more sustainable future for new generations.

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Abbreviations

EBRD – European Bank of Reconstruction and Development

GW – gigawatt

GWh – gigawatt- hour

GWEC - Global Wind Energy Council

KNPP –Khmelnicki nuclear power plant

Mtoe – million tones of oil equivalent

MW – megawatt

MWh – megawatt-hour

NECU – Nacional Ecology Center of Ukraine

NPP – nuclear power plant

REC – Renewable Energy Center

TFC – Total Fuel Consumption

UWEA – Ukraine wind energy association

TW – terrawat

TWh – terrawat-hour

WWEA – World Wind Energy Association

1 Introduction

1.1.1 Problem definition

Ukraine highly depends on imported fuel (oil and natural gas); even 75 % of it comes from Russia (EUROPE, 2009, p. 114). Ukraine is located in Eastern Europe on the banks of the Black Sea bordering Russia, Poland, Moldova, Romania, Hungary and Slovakia. Due to its geographical location Ukraine occupies a strategic position and is one of the biggest fuel transit countries. Fuel transition network is crossing country's territory and supplies fuel to many different countries. Transition network plays a very important role in Ukraine. According to the government of Ukraine, fuel transition through its territory could ensure secure energy supply to the country (Oecd & International Energy, 2006, p. 20).

Today country is dealing with energy security issue because it does not have enough energy resources to satisfy country's needs. To make matters worse fuel is mainly imported from the single supplier. Ukraine is trying to escape that by increasing electricity production from nuclear power plants, yet this makes it a "trade bad for worse" scenario. (Denisenko & Pasyuk, 2010, p. 10).

Almost all of its nuclear power plants have been built during the times of the Soviet Union and cover only the limited share of country's demand for energy. Additionally many of them are also outdated. Not long ago, an accident occurred at the Rivne Nuclear Power Plant reactor. The very same Reactor was to expire on December, 2010, but the decision was made to extend its operation for another 20 years. According to the experts from the National Ecological Center of Ukraine, such reckless experimentation with outdated nuclear reactors could lead to a new ecological catastrophe (Ukraine Nacional Ecological Center, 2011).

At the end of 2005 - beginning of 2006, Russia highly raised the price of natural gas to Ukraine. This was perceived by many countries as a Russian attempt to crush Ukraine economically (Gallis, 2006, p. 1) The "big neighbor" cut off the gas supply to Ukraine few more times in 2006 and 2009. Consequently, these cut offs caused reduction of gas supply to many other European countries and Ukraine experienced economic problems (Lawe, 2009). Some industrial companies such as concern "Stirol" and "Severodoneckoe objedinenie Azot" had to stop their performance for some time due to the lack of gas. Others restricted their activities. This lead to enormous financial losses (Tishchenko, 2009).

There is another environmental concern when it comes to the energy sector in Ukraine. The country has extensive coal resources and many operating coal mines. The problem is that a number of them are outdated and the working environment in these mines is dangerous and unhealthy (Oecd & International Energy, 2006, p. 241). Coal mines in Ukraine are considered to be the most dangerous mines in the world after the China (Oecd & International Energy, 2006, p. 20).

Furthermore, energy sector in Ukraine is a significant contributor of local air pollution: 70% of domestic greenhouse gases emissions come from this sector. It is also the largest contributor of carbon dioxide (CO₂) and methane (CH₄) emissions. "Globally, Ukraine ranks 20th in the emissions of CO₂ from fuel combustion and 8th in energy-related CH₄ emissions"(Black&Veatch, 2011, p. 34).

As a member of Energy Community, Ukraine has an obligation to increase a share of renewables to reach 12 % of the total energy balance of the country by 2020 (Berezovski,

2012). This is one of the reasons for the country to find an alternative to fulfill this requirement. Another problem comes with increasing costs of energy sources so renewable energy sector development could become a solution to these problems. (EUROPE, 2009, p. 118).

Wind, solar, hydro and other type of renewable energy provides many possibilities for the countries and offers many environmental benefits. Wind energy has substantial potential to reduce GHGs emissions as it does not contribute to the air pollution and global warming (Oecd & International Energy, 2006, pp. 346-347).

The future expansion of renewable energy sector in Ukraine highly depends on governmental policy. International experience shows that countries with the wide-range use of renewable energy, such as Germany or Brasil have usually targeted governmental policies for support of renewables (Oecd & International Energy, 2006, p. 347). Germany is one of the worldwide leaders when it comes to use of renewable energy. The main instrument encouraging the increasing usage of wind energy is rather simple. German government adopted “The Energy Act EEG” which ensures priority access to the grid for wind turbines and a fixed remuneration during the period of 20 years (WWEA, 2008).

According to the current executive chairman of the board of Ukraine Wind Energy Association Ukraine has a potential of 16 GW installed capacity and could generate about 35 TWh of electricity (Konechenkov, 2012). According to the results of 2010 for the wind power development and usage in industrial sector, wind power could compete with the hydro energy and nuclear power even in such energy-consuming countries as Ukraine and Russia only if the energy strategy is targeted to the right direction for the wind energy together with the right governmental participation (Neuberger, Nollet, & Pivnyak, 2011, p. 364).

Wind energy does not emit any carbon dioxide or other pollutants that contributes to climate change. During the six months of operational period, wind turbine offsets all emissions caused by its construction, to run virtually carbon free for the remainder of its 20 years lifespan. “Further, in an increasingly carbon-constrained world, wind power is a risk-free insurance against the long term downside of carbon intense investments.”(GWEC, 2012).

About 242 GWh of green electricity was produced in 2010 in Ukraine (Lukashchuk, 2012). This makes only tiny share of a 0.12 % in the total electricity production. Electricity produced from the wind comprises only 0.026%.

The government of Ukraine has already implemented a number of laws, regulations and programmes associated to the renewable energy (Oecd & International Energy, 2006, p. 347). So why the development of wind energy sector in Ukraine is so slow? What challenges does it face?

This thesis is taking a look at the potential of the wind energy production and investigates existing conditions for the development and expansion of this renewable sector. During the research barriers and incentives for wind energy promotion were found and discussed in the chapters below.

1.2 The aim of the thesis

The aim of this thesis is to analyze the current situation in wind energy development in Ukraine and to explore the challenges that Ukraine faces while implementing wind energy

projects. The research was done to understand what actions are needed to minimize the obstacles for the wind energy sector to become more attractive to the investors.

The research question:

What barriers and drivers exist in wind energy projects implementation in Ukraine?

1.3 Targeted audience

The target audience for this research is local and international investors interested in the Ukrainian market. Companies penetrating into the Ukrainian energy market could be interested in the results of this research since it provides detailed information about the incentives and constraints compiled from various information sources.

Local authorities might be interested as well, as the research has identified a number of issues that could help to improve existing situation. The research could help to set up realistic picture of the renewable energy situation in the country for the policy makers. They could be interested because research reveals the imperfection of some existing legislation and procedural gaps. This might help to change situation in the better way in the future.

1.4 Limitations and Scope

The scope of the thesis is to investigate the situation in Ukraine for the wind energy related projects' implementation and development. There are several limitations within the given timeframe.

One of the limitations was related to the search for interviewees among the potential players and consultants. During the search process multiple actors were found and many requests were sent, yet not all the requests were responded to. However, those interviewees who responded were found to be very useful. They provided invaluable information that helped the thesis author to grasp a better insight on the matter.

Many legal documents are not translated in any other language but Ukrainian. It created some obstacles, but local translators and online dictionary helped to minimize these obstacles.

Another limitation was related to the access to relevant literature sources, some being prohibitively expensive or protected by proprietary rights.

Delimitation was not to look into existing wind energy technologies. The aim of the thesis was not to analyze technical specifics, but to focus on the existing actors (banks, associations, private companies). During the research other renewable energy sources were excluded from the scope of the research and focus only on wind energy. Nevertheless, further analysis of other renewable energy sources would be useful to fully investigate the overall potential of renewable energy sources in Ukraine.

1.5 Methodology

The topic related to the wind energy in Ukraine is very wide and not much research has been done. However, the development of wind energy is an important topic to Ukraine. This country is special in terms of its significant challenges related to energy security, dependence on mono-fuel domestically, single supplier outside the country and significant potential of wind resources. A more in depth research needs to be done for the long term perspectives

which could lead the country towards the stable energy sector together with energy independency and security. The research is necessary in order to emphasize problems and find out the long term solutions how to effectively solve it.

The methodology of thesis is based on the academic literature review in order to analyze current potential of winds energy in Ukraine. The collection of data included personal communication using semi-structured interviews with selected stakeholders. The interviews were completed with representatives of NGO's or private local and foreign companies operating in renewable energy sector. Some of the interviewees were found on related websites, while other contacts were obtained during the first interviews. One week was spent in Kiev, in order to gain a better access to the primary information through direct communication with the local people. Some personal interviews were conducted in Kiev, while others were conducted using Skype platform. Also a number of questionnaires have been sent via an e-mail. This was done in order to understand the whole picture about the wind energy project implementation in Ukraine. At the beginning of the research a large amount of interviews had been planned, but due to the busy schedules of representatives or their unwillingness to share information many interviews have not been arranged. The list of the interviews and the set of questions are presented in the Appendix.

A further in depth analysis was completed by studying multiple literature reviews. This included analysis of various scientific articles, governmental documentation such as EU directives, Ukraine legislation, energy strategy review and comments provided by the experts. Different policies have been reviewed together with various reports and minutes from conferences on the wind energy. Sources of social media and web-sites have also been taken advantage off.

1.6 The framework

Two frameworks have been used to analyze data gained from multiple sources. The framework provided by the Stefan Jacobsson and Ana Johnson was used to describe the current situation in the energy sector in Ukraine (Jacobsson & Johnson, 2000). This framework was suggested by authors to be used for energy system transformation analysis. Three main elements are distinguished in the framework:

- Actors
- Networks
- Institutions

These key elements described below were found relevant to the research. Jacobsson and Johnson adopted this framework for the diffusion of renewable energy technology. This framework was found useful, because it specifies the position of the wind energy in the current market. The framework explains interaction between the different actors and institutions. Sometimes they are working as clusters within the market and show differences of their roles which often depend on the existing network.

Later PEST (political, economic, social, technological) framework was used in order to categorize the findings and to analyze the drivers and barriers for the wind energy. PEST analyzes is one of the variation of PESTEL. PESTEL analyses are used in the strategic management. The thesis is focusing in wind energy market development. The PEST elements could represent country characteristics itself, so these elements were found useful

for the analyses for identification of key factors for wind energy development (Bivolaru, 2009). These key factors are described section below.

1.6.1 Actors and their competence

Actors, the first of three elements, are playing significant role in the energy market. Actors who technically, financially and politically have enough power for the initiation or strong contribution to the development and diffusion of new technology are called the “prime mover” (Jacobsson & Johnson, 2000, p. 630). They have been divided in two groups: governmental and non-governmental organizations. Governmental actors’ often are influencing non-governmental organizations, such as industrial companies through the legislation network. Non-governmental actors are playing their own role within the energy market as well. Non-governmental actors such as oligopoly companies often have enough power to pressure governmental organizations if they will realize that it will generate some benefits for them. The more detailed information about the actor’s performances and their responsibilities and position in the energy market are provided in the chapter below.

There are some issues with actors that can be faced. A possibility exists that the prevailing systems could be “locked in” into the traditional technologies. Actors could then not look to opportunities and possibilities outside their traditional zones of action and understanding (Jacobsson & Johnson, 2000, p. 633).

1.6.2 Institutions

Institutions are divided into so-called “hard” ones and the “soft” ones. The hard ones include legislation, educational system, capital market etc. While the culture, traditions or habits makes up soft institutions. Various institutions are playing different roles. For example some institutions provide a high connectivity in the system and some of them are affecting the structure of incentives. Institutional economics state that institutions are significantly impacting the pathway that technology proceeds. (Jacobsson & Johnson, 2000, p. 630)

In this paper legislation and energy policy have been presented under the umbrella of institutions. Legislation is significant element in the energy market. Every single step towards the renewable energy development depends on this element. It could lock out wind energy expansion or could accelerate this sector development. The analyses of legislation allow setting up the picture, where different actors are affluent by this element. In the thesis the most important regulatory framework aspects for wind energy are presented. This is later helps identify barriers and drivers more precisely.

Institutions can also fail. For the existing incumbent technology legislation may possibly lack be preconception and not objective. For example, educational system could too much support the existing technologies and companies. This related an obstacle since when the new technology emerges institutions may not be able to react fast enough. (Jacobsson & Johnson, 2000, p. 632) In some cases could happened that new law could be bias and be very useful only for some specific actors, such as monopoly companies.

1.6.3 Networks

The network is the third element. It comes in handy in new problem identification. Network could also develop new technical solutions using its connections. Companies that are deeply integrated into the network usually generate larger resources of information, knowledge, and technology and also increase the level of independency. This creates additional value for the companies. The network also helps to understand and realize new possibilities. For example,

this might be related to the prospect of the future, which then leads specific investment decisions. (Jacobsson & Johnson, 2000, p. 630) During the research some features of the existing network in Ukraine have been identified and described in the chapters below.

The “weak” failure of network arises, when companies are not in connection to other firms. One of the “strong” failures is when the different companies are being managed by others in the wrong direction or fail to provide each other with the essential knowledge. (Jacobsson & Johnson, 2000, p. 632) PEST

PEST analysis in the thesis is represented as a qualitative analysis of the existing environment in the energy sector within the country.

Political aspects could be considered policy changes, political stability, changes in the legislation etc. Economic factor comprises financial issues, loan interest rate provided by banks etc. Social factors could be considered cultural issues, Technological aspects could be production, distributions etc. The findings using these elements are represented.

The results of the company’s performance depends on different factors: national economic, political and cultural development, regulations of legislation performance, willingness and ability of funding within the bank sector etc. (Šliogerienė, Kaklauskas, Zavadskas, Bivainis, & Seniut, 2009, p. 496).

1.7 Outline of the study

The thesis is comprised of five main chapters. The second chapter presents the situation in the energy sector in general, including period from starting from the Soviet Union collapse. This chapter describes problems with energy security, nuclear issue, energy transit etc. The big part in this section represent current situation related to wind energy. This includes transmission problems, overview of the growth of wind energy etc.

In the third chapter the wind energy market is represented using the framework suggested by Jacobsson and Johnson (2000). The framework has three main elements (actors, institutions and networks). Using this three elements wind energy segment is divided in different sectors and described in details.

The fourth chapter comprises analyzes using PEST analytical tool. The findings are grouped in four different categories regarding to their features. Every category includes barriers and drivers. The features of barriers and drivers are discussed further. The conclusions are presented in the 5th chapter.

2 Energy situation in Ukraine

This chapter aims to give an overview of the energy sector in Ukraine, and a picture of the energy market. The information about the tendency in the country is provided by the document “Ukraine Energy Policy Review 2006” prepared by the International Energy Agency (IEA). According to the document, energy consumption decreased mainly due to the Soviet Union collapse and later due to the economic recession. However the latest trend shows that Ukraine has increased its energy production. The information from the different sources was combined and includes different periods. Moreover the chapter also describes the energy security issue related with fuel import faced by Ukraine. Furthermore this section focuses particularly on the wind energy sector, since it is one of fastest developing sector in the world- and Ukraine has a big potential of that. According to forecasts of World Wind Energy Association (WWEA, 2010) wind energy installed capacity could reach 1500 GW by 2020. Ukraine has a goal till 2020 installed 9 GW of renewables. Wind power would provide 5600 GW (Berezovski, 2012).

2.1 Overview of the energy sector

2.1.1 Energy production from different sources of fuel

One of the main sources for energy production in Ukraine is natural gas. The natural gas produced locally comprises only 25 % of the country’s demand. The rest of the required gas is imported using distributional network belonging to Russia. (Oecd & International Energy, 2006, p. 19) The state-owned company called Naftogaz of Ukraine is responsible for the performance related with the production of natural gas. Naftogaz of Ukraine operates and runs networks of transition and sales of gas, while regional companies are responsible for gas delivering and retail trades. (Oecd & International Energy, 2006, p. 18)

The other important source of energy for Ukraine is coal. Ukraine was one of the leaders in coal production and consumption until 1970. Coal comprises about 31 percent of Total Primary Energy Supply. The annual extraction of coal is about 80 million tons. During the period from 1993 till 1997 coal production decreased. However, during that period the share of coal importation in total supply was higher than today. This decline was associated with the reduction of the budget sharing to the coal industry, closing of non-profitable mines etc. (Oecd & International Energy, 2006, p. 75)

Today there are still many working coal mines. But the problem is that many of them are outdated and are more than 40 years old. The working environment in such mines is dangerous and unhealthy (Oecd & International Energy, 2006, p. 241). Coal mines in Ukraine are considered being the most dangerous mines in the world right after China (Oecd & International Energy, 2006, p. 20).

Nuclear energy is the third important energy source in Ukraine since 1996. Nuclear power was increased mostly by the governmental policy. Government was encouraging nuclear power to decline the dependency on imported hydrocarbons. The share of nuclear was increased by 6,2% and reached 16.2% in TPES in 2004 compared with the 1993, when the share of coal was 10.5% in TPES. While coal is mostly produced domestically, the biggest part of fuel is imported in order to cover country demand (Oecd & International Energy, 2006, p. 77). According the Ukraine governmental forecasts in the future the amount of energy produced by the nuclear power stations will remain at the level of 2005, but the total production should increase more than twice. (Oecd & International Energy, 2006, p. 289)

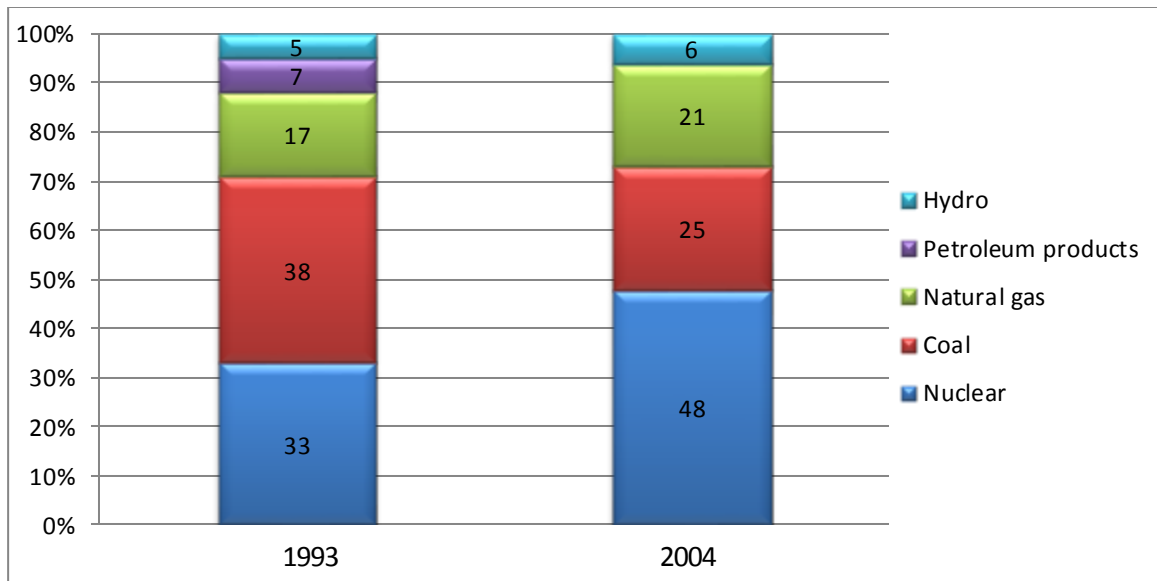


Figure 2-1 The data about the electricity Production by Fuel, 1993-2004, in percentage

Source: Oecd & International Energy, 2006

The figure shows that electricity production mainly relied on the nuclear energy and coal in Ukraine. While the nuclear energy production increases, the coal production decreased. However energy produced from nuclear and fossil fuel provides the biggest part in the energy. Expansion of the wind energy sector together with other renewables could help to reduce this dependency.

2.1.2 Energy consumption by sectors

The main energy consumers in Ukraine are the industrial and the residential sector. During the period from 1993 till 1998 the industrial sector faced one of the biggest and heaviest fall of energy consumption. Energy consumption decreased during this period mainly for due to economic crises. But this fall was not as high in the energy intense industry sectors such as mining, and metallurgy as in the other industrial sectors. During the period from 1998 till 2004 the energy consumption was stable, in spite of the growth in industrial production. This fact shows that, in some parts of energy systems efficiency was improved. The total final energy consumption in 2004 was 84.6 Mtoe (Oecd & International Energy, 2006, p. 64)

The residential sector is the second biggest energy consumer. The Total Final Consumption (TFC) by the residential sector was 24.3 Mtoe in 2004 and counted about 29 % of TFC. The reduction of energy consumption in residential sector was not so dramatically like in the industrial sectors. There are several issues related with that. The reduction went smoothly by the reason that prices for energy sector was distorted and government were subsidies this segment ensuring very low tariffs for energy (heat, gas, electricity production etc.) consumption.

The other issue related why the drop of the energy consumption was small was residents' consumption habits. The problem was that residents were not paying for entire energy service. This means that fees for the electricity paid by residents was too low and not covering the costs of electricity production and supplier (Oecd & International Energy, 2006, p. 65). Residents are paying approximately 0,01 Eurocent for 1 kWh, while the industrial

sector is paying a much higher price about 0,02 Eurocent for 1 kWh (Denisenko). This was not and still is not encouraging in order to change the habits and reduce of energy consumption. Another issue with energy wasting was related with the metering equipment. In that time former Soviet Union countries faced lack of energy metering equipment's in general. The energy consumption (heating etc.) was not measured properly, which means that no one cares how much energy, they were used. This factor didn't influence the resident's habits to reduce their consumption nobody cares about the wastage of energy. (Oecd & International Energy, 2006, p. 65).

The situation related with the people habits it's not changed too much today. Mr. A. Denisenko during the personal communication explained that today in Ukraine society still is not care too much, how much electricity they consume. Costs for electricity shares small part of the budget in general. However it depends on many factors.

2.1.3 Reliance on imported energy

Today many of the European countries heavily depend on energy import. Ukraine is one of them and heavily depend on the Russian policy and decisions made by politicians, because Russia is one of the main gas and oil supplier (Gallis, 2006, p. 3). The imported natural gas and oil comprises about 75 % of country demand (EUROPE, 2009, p. 114).

The Russian company Gazprom is, one out of five oil producers, is leaders in the market and holds one of the biggest gas resources in the world. The company is one of the major gas suppliers for the Russia and for foreign states. Gazprom holds one of the biggest gas transmission network systems in the world called Unified Gas Supply System of Russia. The company retails and transfers the gas for more than 30 countries (Gazprom, 2012). Gazprom keeps actual control for the import of gas to the Ukraine (Oecd & International Energy, 2006, p. 168).

Gazprom is regulating the transit network of energy distribution to Ukraine and frightening to increase the prices for transit fees. Putin, the president of Russia, stated that Gazprom is a "powerful political and economic lever of influence over the rest of the world" (Gallis, 2006, p. 4).

According to some countries Russia has an interest to influence and increased the force in the market of the energy sector and by this reason Russia wants to keep prices for energy in the high level in order to increase the profit (Gallis, 2006, p. 4).

The governments of these countries remarks that Russia controls the Gazprom performance and that Gazprom is operating like an oligopoly company and heightening prices of gas for Ukraine and thus ratcheting the country (Gallis, 2006, p. 4).

One of the issues related with the energy security was faced in 2005. Many countries saw the struggles of Russia to crush Ukraine, when Russia dramatically raised the price of natural gas for Ukraine in the end of 2005 and at the beginning of 2006. (Gallis, 2006, p. 1)

Russia cut off gas the supply to Ukraine a few times in 2006 and 2009. These cut-offs also caused a reduction of gas supply to many European countries (Lawe, 2009).

Also for this reason Ukraine experienced economic problems. Some industrial companies such as "Stirol" and "Severodoneckoe objedinenie Azot" had stopped their production for

some time for the lack of gas as others had to restrict their activities. This has caused huge financial losses for Ukraine (Tishchenko, 2009).

Gazprom is influencing gas supplier market not only in Ukraine, but in other countries as well. Central Asia, Caucasus, Balkans, Moldova, Ukraine, Baltic States are strongly influenced by the Gazprom policy in energy market. Organization is expanding his power of influence by buying new companies and trying to penetrate in to the market more and more. "There is virtually no former Soviet Union or Eastern European country in which Gazprom is not present in gas distribution." (Oecd & International Energy, 2006, p. 228).

There is no possibility for gas market liberalization when countries depend on one supplier without any competitors. In such conditions market faces the problem related with distortion (Gallis, 2006, p. 4).

2.1.4 Energy transit

Ukraine is playing an important role in the energy transit due to the geographical location. The gas and oil are significant factors in formation process of Ukraine political situation in the country. This is having an influence for the determination of the relationship with the neighboring countries (Oecd & International Energy, 2006, p. 204).

The main supplier of oil and gas is Russia. Country located in the Eastern Europe in connection with the Black Sea and between Russia and Poland and has borders with the Moldova, Romania, Hungary and Slovakia. Due to the geographical location Ukraine occupies a strategic position and is one of the biggest fuel transit countries. The fuel transit network which supplies fuel for many different countries are crossing Ukraine territory. The network is playing very important role for the country. According to Ukraine government opinion and view the transit is a tool which could ensure a secure energy supply (Oecd & International Energy, 2006, p. 20).

The transit sector generates a lot of incomes and is one of the major revenue suppliers for the state budget. One of the biggest companies is Naftogaz of Ukraine. This is state owned company working with distribution network. For oil and gas transition Naftogas earned about 2 billion USD in 2002 and 1.9 billion USD in 2003. The length of transition pipelines of gas in Ukraine are about 37600 km. Gas distributional network have total length about 210 000 km and owned by the State Property fund. (Oecd & International Energy, 2006, p. 207)

Gas reaches Ukraine from different parts of Russia and crosses the country from the Belarus as well. The major part of gas which is delivered to the other countries is exported using pipes network system through the Slovak Republic. Certain part of gas is delivered to Southern Russia, Moldova, Poland, Romania and Hungary. (Oecd & International Energy, 2006, p. 208).

The oil is transported through a grid of three pipelines. This network is running by the Joint Stock Company Urkrtransnafta. (Oecd & International Energy, 2006, p. 230)

In Ukraine oil transportation was decreased starting from 1991. Russia wants to reduce the dependency of Ukraine for the transition network and is searching for ways to transition route diversification. By this reason the volume of transported oil in 2005 was 16 percent less

comparing with previous years, because Russia built an alternative pipeline, which is not cross the country. (Oecd & International Energy, 2006, pp. 231-232).

Ukraine transit network are very important for foreign states as they are heavily depending on the energy import. In the one hand well-developed network for Ukraine is one of elements stimulating transit of fossil fuel because of the revenues. On the other hand Ukraine could export wind energy as well. The export of electricity from Ukraine produced from the renewable sources could help foreign countries to reduce their GHG emissions and to contribute to the sustainable environment development. The increasing shares of the electricity production from renewables would be positive factors toward Europe target to increase share of renewable till 20 % by 2020.

2.1.5 The Nuclear issue

Ukraine government had plans to expand this energy production from nuclear. (Oecd & International Energy, 2006, p. 26)

Mostly all of the nuclear power plants were built during the period of Soviet Union thriving and are covering the basic country demand of energy. Many of them are expired. An accident happened at the reactor of Rivne Nuclear Power Plant on 18 January 2010. The expiry date of that Reactor was December 2009. The accident happened. However the decision was made to extend its operation for another 20th years. According the experts from National Ecological Center of Ukraine the experimentation of government with extension of outdated nuclear reactors lifetime could lead to a new ecological catastrophe (Ukraine Nacional Ecological Center, 2011).

This power sector faced the problem related with market distortion, because the sale tariffs failed and didn't cover the costs of nuclear energy. In 15th of March in 2006 the Cabinet of Ministers of Ukraine approved the Energy Strategy of Ukraine by decree No.145-p. This document emphasized the aims of the Ukraine and set up the priorities in country fuel and energy complex. (Denisenko & Pasyuk, 2010, p. 6)

The document was strongly criticized by the Ukrainian and international experts, and was not approved by the Ukrainian parliament. (Denisenko & Pasyuk, 2010, p. 10)

In general nuclear sector has huge risk potential. In 1980s VVER-1000 (V-320) series of nuclear reactors were installed, while nowadays it is planned to install VVER-1000 (V-392B) series of reactors. Yet the latter series of reactors have not been installed up to date which makes their safety questionable, especially for the application in half-constructed facilities of the KNPP. (Denisenko & Pasyuk, 2010, p. 6)

Nuclear reactors required huge amount of water required for cooling. And Ukraine faced this problem. "According to international classification, Ukraine is among the countries that have poor water resources (1000 m³ per person). In most regions of Ukraine this index is very low or extremely low (0.11 to 1.95 thousand m³)." (Denisenko & Pasyuk, 2010, p. 7) And one of the nuclear reactor series VVER-1000 requires 60 m³ per one hour. However Ukraine nuclear power plants are constructed exactly in the areas which faced problem with the scarcity of water resource. Below are presented geographical conditions of KNPP location.

Khmelnitsky NPP is situated in the upper course of the Goryn River. Because of insufficient flow volume, the Goryn River is not able to cool the four power units of the KNPP without causing damage to the river's ecosystem. Located in the middle course of the Styr River is

the Rivne NPP. Further construction of the Rivne NPP is not possible because water resources are not sufficient during the low-flow period. The projected mode of operation for a power-generation plant on the Southern Buh River suggests that water levels may fluctuate over 2 meters during the day. This will have serious detrimental effects on the river's natural conditions which could affect an area of over 100km. (Denisenko & Pasyuk, 2010, p. 7)

Another problem related with nuclear power is radioactive waste management. The reactor of series VVER-1000 could produce from 40,000 m³ to 135,000 m³ of liquid radioactive waste. Running the NPP provides the generation of solid waste, contaminated by the radioactive particles, such as working clothes, construction materials, equipment's, and instruments and so on. This waste can't be recycled and requires to be buried. All NPP in Ukraine are generated radioactive waste but the National Nuclear Company Energoatom, who is an operator, did nothing to solve this problem. (Denisenko & Pasyuk, 2010, p. 7) According the International Atomic Energy Agency Ukraine is on the 7th place in world and the 4th in the Europe by the installed capacity of nuclear power. (Denisenko & Pasyuk, 2010, p. 12)

Ukraine in terms of nuclear fuel also is depending on Russia. Russia suppliers 100 % fresh nuclear power materials and 60 % equipment required for nuclear energy sector. "Even if Russia provides a loan for construction, the money will likely be used only to buy the Russian made equipment. In other words, Russia will invest in its own industry at the expense of Ukraine" (Denisenko & Pasyuk, 2010, p. 19)

The other issue faced in nuclear sector is related with human resources. The reason is that highly qualified experts migrated in order to work with more financially attractive projects out of the country. (Denisenko & Pasyuk, 2010, p. 21)

Nuclear power sector is loses making and is unsuccessful. This sector can't exists without the governmental support. Much more efficient could be to use the resources required for the nuclear power sector for the expansion and development of alternative energy sources. (Denisenko & Pasyuk, 2010, p. 20)

2.1.6 Energy efficiency

Ukraine has huge potential for energy efficiency improvements. "It is one the most energy intensive countries in the world, even more so than energy-rich Russia".

The losses were faced in the entire energy chain, from the energy production to conversion and consumption. (Oecd & International Energy, 2006) These losses in the energy chain were more than 18 percent during the five years period from 1999 to 2004 in Ukraine (Oecd & International Energy, 2006, p. 272). This is a huge area for improvement in energy savings. According the government approximations Ukraine has potential for energy savings, which would be in equivalent for amount of energy produced from four hundred nuclear power plants in 2030, if Ukraine will implement energy efficiency improvements (Oecd & International Energy, 2006, p. 81).

As was presented in the previous sub-chapters the issue for the long-term energy distribution policy is that expenses are not fully covered by the prices. In order to improve the situation Ukraine government has to improve the efficiency and to raise the prices in order to cover all costs related with the energy efficiency network. The Ukraine parliament and different

governmental bodies has to work in collaboration in the same direction, but this is often a problematic process (Oecd & International Energy, 2006, p. 115).

There is another issue related with losses faced in Ukraine. The biggest part of district heating systems are outdated and required renovation. The same situation exists with technologies produced during the Soviet Union thrive and used in industrial sector. This represents tremendous potential for energy savings as well. Insulation in the district heating systems is very poor and doesn't meet standards which are valid today. The same situation is with the building sector. Building systems constructed during the Soviet Union period are highly energy inefficient. (Oecd & International Energy, 2006, p. 106).

The reason was that during the construction in many cases insulation were not used. There was no common practice to do that. During the Soviet Union period the problem was faced with the shortage of goods in general. Only high-ranking officials had possibility to get the shortage production or materials on that time.

Today the prices for electricity are made low by governmental subsidies, but Ukraine government is not changing anything. The reason for such decision is election to the Verkhovna Rada (Ukraine parliament), which will happen by the end of this year. Politicians are willing to be reelected for the next term and the decision to raise prices for electricity and energy could make them unpopular for the citizens. By this reason politicians are doing nothing for the improvements in energy sector. There is hope that after the election situation will be change, otherwise the consequences could be dire, because by the last 20 years nothing was done related with renovation, insulation etc. and it is impossible that energy systems would be continue exploited in the same regime. (Denisenko, 2012).

2.2 Renewable energy

According the Ernst&Young Ukraine is on the 32nd place on the list over the 40 in the Renewable Energy Country Attractiveness Indices. In 2011 was first time when Ukraine was mentioned in this list (UWEA, 2011). The report prepared by the Ernst&Young declares renewable energy resource potential in Ukraine as "impressive" (Newswire, 2011). Different countries were compared and evaluated using different criteria, such climate conditions, geographical location, populations, legislation framework etc. The calculation of attractiveness index of Ukraine was based on the technology factor (65%) and renewables infrastructure index (35%). The renewable infrastructure indices few factors:

- electricity market regulatory risk (29 %)
- planning and grid connection issues (42%)
- access to finance (29%)

Technology factors include 6 technology-based indices:

- offshore wind
- onshore wind
- solar photovoltaic
- concentrating solar power
- geothermal and biomass
- other recourses (landfill gas, small hydro, wave and tidal technologies)(Trypolska, 2012, p. 650)

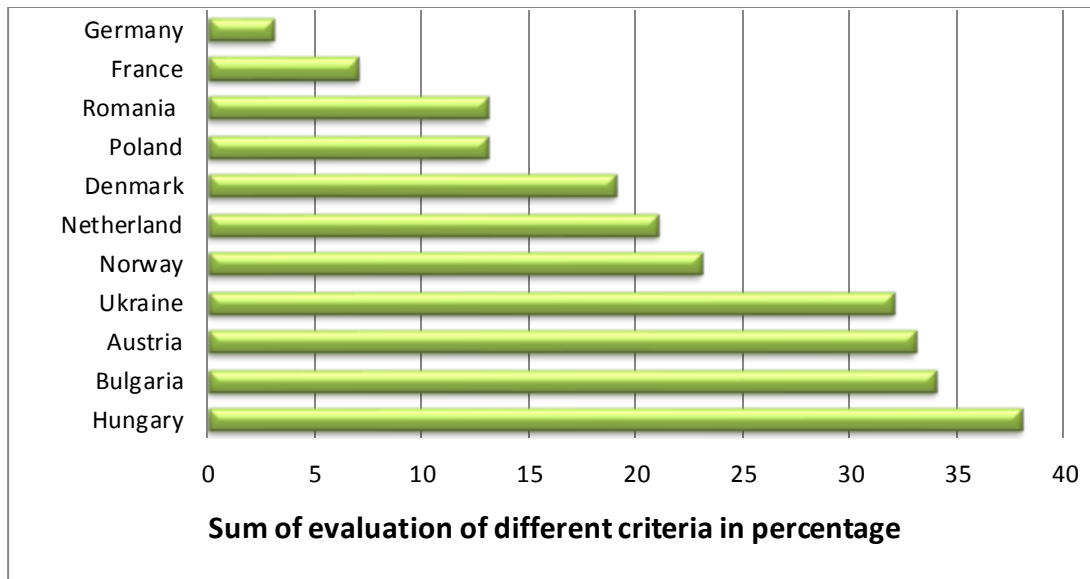


Figure 2-2 Ernst and Young's favorability indices for renewables investments among European countries
Source: Trypolska, (2012)

But Ukraine is hardly exploited this potential. The problem why these projects were developed very slowly is that the legislative and regulatory frameworks were not sufficient for the some potentially possible projects in the area (EBRD).

Today 64 companies have received green tariff and 411 MW capacity of renewables were installed and more than 2 billion Euros were invested (Berezovski, 2012).

Table 2-1 Information about the installed capacity of renewables and electricity production

The source of the renewable	The number of objects			Installed capacity MW			Electricity production GWh per year		
	2010	2011	01.07.12	2010	2011	01.07.12	2010	2011	01.07.12
Wind energy	8	11	12	76,57	146,41	179,51	49,17	89,03	113,54
Solar energy	2	18	23	2,5	188,22	265,78	0,50	30,05	145,11
Small hydro	57	73	78	63,20	70,81	72,75	192,51	203,41	101,90
Bio-energy	2	2	2	4,2	4,2	4,2	0,00	9,60	7,17
Total	69	104	115	146,47	409,65	522,25	242,19	332,10	367,73

Source: Lukashchuk, (2012)

As Table 2-1 shown on 1th of July of 2012 the installed capacity of renewable energy facilities comprises 522,25 MW (367,73 GWh electricity) and it was 35,63 GWh more than in 2011 (332,10 GWh) (Lukashchuk, 2012). According to information from the Table 2-1 there is growth in the wind energy market.

energy zones that are rated 300-350 (W/m²) are 12 % developable and the wind area which has higher density than 350 W/m² are 50 % developable. “(EBRD, 2011a)

According to the estimations (EBRD, 2011a) 7000 km² of the Ukraine territory can be used for the wind park constructions. It is accepted that 16 GW of technically feasible capacity can be built and the potential of wind energy is about 42 TWh. (Geletukha G., Zhelyezna T., Zhovmir M., Konechenkov A., & Yu.). The Table 2-2 shows information about the wind energy development potential in different regions:

Table 2-2 The wind energy development potential in different regions in Ukraine

Regional Electric Power Systems	Oblast	Wind Development Potential in Oblast (MW)
Central	Cherkasy	813
	Kyiv	333
	Zhytomir	83
Crimea	Crimea	2839
Dnipro	Dnipropitrovsk	229
	Kirovograd	646
	Zaporizhia	2104
Donbass	Doneck	1521
	Luhansk	2292
Northern	Poltava	229
Southern	Kherosn	1979
	Mikolaev	63
	Odessa	833
Southwestern	Chernivtsi	396
	Khmelnyskyi	250
	Temopil	3149
Western	Ivano-Frankivsk	3878
	L'viv	12083
	Rivne	2438

Source: EBRD (2011)

In the figure it is seen that the best parts for wind energy in Ukraine are in the Carpathians, Crimea and South Cost of Ukraine and Donbass region as well. The areas along Dniper River and Central Ukraine are windy as well and are considered attractive for the wind energy development.

2.3.2 Transmission areas

Generated electricity through the transmission lines are transferring to the grid and later deliver electricity to the customers. Electricity transmission lines are very important condition for the grid. This section identifies the areas, with the huge wind energy resource, but with problems related to transmission lines.

For the wind energy deployment the transmission network is necessary condition. However some issue related with transmission lines arises. Transmission systems which operate in the lower voltages can indicate additional limitations and capabilities for the distribution of power to the local load centers (EBRD, 2011a, p. 5).

In the Ukraine, the oblasts export energy due to high energy generation, which is facilitated by the enormous transfer capacity. However, the primary limitation in this regard is the lack of demand for wind energy in the regional markets. Poor wind velocity and limited transmission capacity can be considered as the main constraints in other regions(EBRD, 2011a, p. 5).

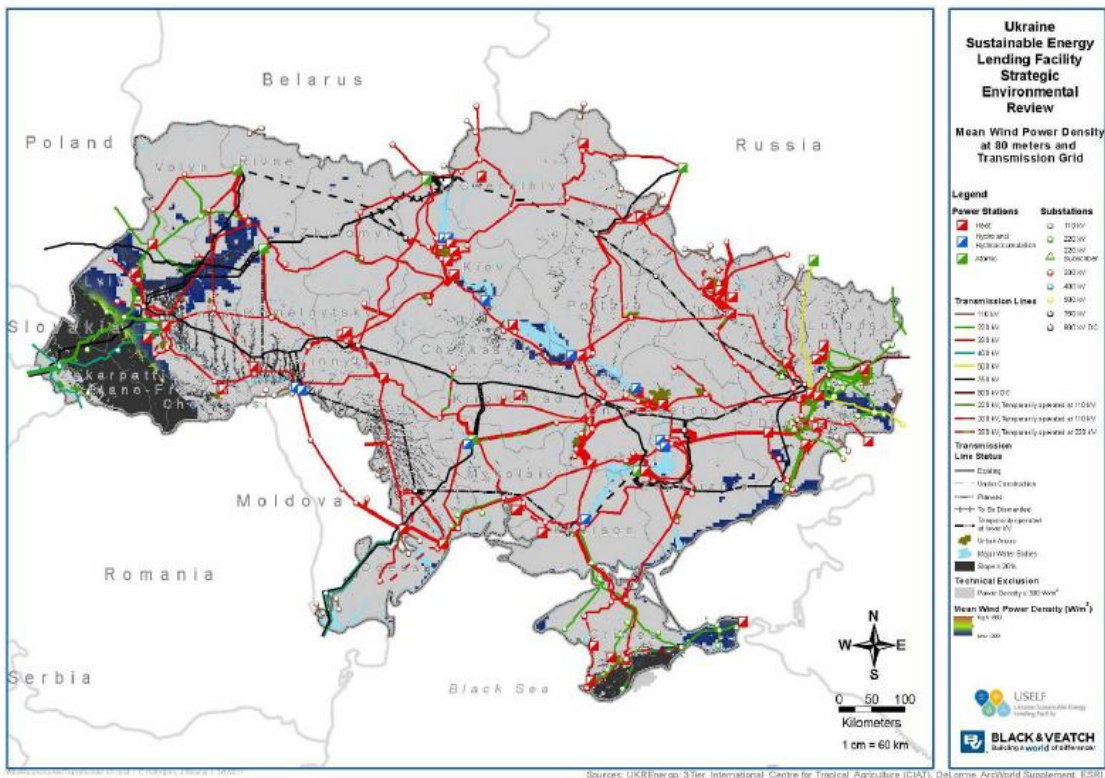


Figure 2-4 The existing electricity transmission network in Ukraine
 Source : EBRD, (2011)

The most complicated transmission system is in Crimea. The system has approximately only about 2500 MW of export and import capacity. Crimea has huge potential of wind, but has constrained for the transmission. The problem related to the transmission lines faced Mykolaiv and Kherson regions. This is more related with the existing substantial interconnection. The power could be distributed by the long distances at lower voltage to major substations; however huge distributional losses could happen. The huge challenge would be the absorption of the output for the region causes huge regional load. There is expectation that in the northern regions would be very small development (EBRD, 2011a, p. 6).

2.3.3 Dynamics of growth of wind power in Ukraine

According the information provided by National Commission which Implements State Regulation Energy Sector in Ukraine (NERC) and the Republican Committee for fuel and

Energy of the AR Crimea new 66, 1 MW wind capacity were installed in 2011 and 151,1 MW of total capacity was reached by the end of 2011 and thus the installed capacity in 2011 increased by 73 %, comparing with the capacity installed in 2010 (UWEA, 2011, p. 3).

Table 2-3 Wind power plants built under the State Complex Program during 1998 and 2008 shown in the table below

Name of WPP	Region of Ukraine	Beginning of construction	Design capacity MW	Installed capacity at the end of 2011 MW
Novozavodskaya WPP	Doneck region	1998	50	21,8
State Enterprise "Donuzavslaskaya WPP"	AR Crimea	1993	100	18,3
ETU "Vodenergoremnaladka"	AR Crimea	1996	42	26
Tarkhankutskaya WPP	AR Crimea	2001	70	16,7
State Enterprise "VostochnoKrymskaya WPP"	AR Crimea	2008	9,6	2,8
Total			271,6	85,6

Source: UWEA, (2011)

As shown in the Table 2-3 85,6 MW were installed under the State Complex Program and are 100 % state property. (UWEA, 2011, p. 4).

The State Complex Program was established in 1997. This program was approved in order to develop wind. However the main purpose of this document was to encourage the manufacture in the local former military factories. It was decided to start production of the equipment with the capacity of 107,5 KW. The government had plans to install 1990 MW of wind capacity till 2010. However only about 90 MW of wind energy capacity was installed under this program. All these wind power plants are 100% state property.

The output of production historically was oriented for the former Soviet Union market. The quality of equipment was lower compared with foreign manufacturing and efficiency was low. The result was that the program was closed in 2009, because it lost money. (Tsaturyan, 2010).

The failed of the State Complex Program for wind energy shows that production based on reasonable capacity and reasonable technology are an important element from the economical point of view and appropriate assessment could help to avoid or reduce financial losses.

Table 2.4 The installed capacity of wind power plants during the period from 2010 until 2011

Name of WPP	Region of Ukraine	Beginning of construction	Design capacity (MW)	Installed capacity at the end of 2011 (MW)
Wind Park Novoazovskiy	Doneckk region	2010	57,5	37,5
Wind Park Ochakovskiy	Nikolayev region	2011	125	25
Novorossiyskiy Wind Power Plant	Kherson region	2011	24	3
Total			206,5	65,5

Source: UWEA, (2011)

As could be seen from the table above 65, 5 MW of privately owned wind energy capacity was installed during period from 2010 till 2011. According the information provided by The State Agency and Energy Efficiency of Ukraine almost 89 GWh of green electricity was produced in Ukraine in 2011. Unfortunately, it is impossible to calculate yet how much wind shares of total electricity production in 2011, because the statistical data about the total energy production in 2011 were not yet provided.

The numbers of the installed capacity and the generated electricity are different due to discrepancies between the data provided by the State Energy Agency and UWEA..

2.3.4 Wind turbine manufacture in Ukraine

On November 2011 JSC “Fuhrländer” AG reported about their plans to produce 2,5 MW wind turbines for the Ukraine market together with company JSC “Kramatorsk Heavy Machine Tool Buildings Works” (KZTS). “Fuhrländer Wind Technology” LLC, KZTS will produce about 40 generators, with total capacity 100 MW, using locally-made components in 2012. JSC “Fuhrländer” AG had plans to investments about 55 million euro in the production. And by the end of 2013 Fuhrländer has ambitions to increase their production till 100 units per year (UWEA, 2011, pp. 5-6).

According to Mr. Konechenkov (Konechenkov, 2012) today there is no clarity on who has to provide maintenance service for the wind turbines after decommissions. In developed countries there is common practice that the company which is producing wind turbine is providing later maintenance of the equipment’s (Konechenkov, 2012).

To start production for wind turbines in Ukraine is important step toward wind energy development. The import is financially costly and technologically could be complicated, depending on the size of wind part. There is no sense to import goods if the possibility to produce it locally exists. Besides to start manufacture in the country will help to meet the requirement of local production described by law. So companies will have more chance to get permissions for wind parks construction.

2.3.5 Forecast for 2015-2020

Despite the fact that there is a need to strengthen national policy for renewables and to accelerate wind energy project development there is possibility to reach 700 MW of national wind capacity by the end of 2012. The further expansion growth in particular is expected in the Crimea, Doneck (UWEA, 2011, p. 13).

Comparing information from the Table 2-1, to install 700 MW by the end of 2012 looks rather unrealistic.

According to the draft of “Update of Energy Strategy of Ukraine until 2030 in the electrical engineering industry” it is possible that by the end of 2020 at least 5600 MW could be installed in the country which represents 13 % of the national electricity market respectively (UWEA, 2011, p. 13).

However according to additional calculations made by author it would comprise 11 % of national electricity market.

2.3.6 Proposed projects

Today about 14000 MW of wind projects were proposed, but only 1150 MW of them got technical requirements from Ukrenergo. The Table 2-5 shows the oblasts where interconnection to the national grid were requested for wind projects (EBRD, 2011a).

Table 2-5 The total wind energy interconnection to the national grid by oblast

Regional Electrical System	Oblast	MW
Crimea	Crimea	5279
Dnipro	Zaporizhia	3045
South	Kherson	400
	Odessa	900
	Mikolaiv	2500
Donbass	Doneck	1620
Central	Luhansk	250
	Kyiv	100
	Total	14094

Source: EBRD, (2011)

As could be seen from the table the biggest share of the proposed projects was in Crimea, Dnipro and South regions.

However in reality not all of these proposed projects would achieve completion. Many projects could face interconnection or transmission constraints, as well other could have problems with the permission or development issues (EBRD, 2011a, p. 6).

Mr. Andriy Konechenkov during the personal communication provided information, that some companies were brought into the court Ukrenergo (company that was responsible for the connection to the grid). Companies has had the technical specifications provided by the

Ukrenergo, which means that companies has all permissions requires for the connection to the grid. However Ukrenergo without any reasons didn't connect them to the grid. (Konechenkov, 2012)

2.4 Actors

In Ukraine the actors' who are involved in the energy sector represent governmental organizations, non-governmental organizations, private companies, research institutes and other public institutions. Some of the main actors, who are represents are described in sections below.

2.4.1 Governmental organizations

One of the major players dealing with the renewable energy situation in Ukraine is the Ministry of Fuel and Energy. This Ministry is responsible for the energy sector development, energy strategy development, and improvement of regulations. The Ministry of Fuel and Energy controls the oil, gas, electricity and district heating sectors through the companies named Naftogaz of Ukraine and Energy Company of Ukraine. The Ministry of Fuel and Energy is involved in the process of making international agreements related to fuel supplying and energy agreements related with the nuclear safety etc. (Oecd & International Energy, 2006, p. 36)

Other important actor in the energy sector dealing with renewable energy is the National Electricity Regulation Commission of Ukraine (NERC), which establishes tariffs on electricity sales, prices for the gas and oil transportation. The organization is also regulating tariffs for heat generation. Moreover NERC also controls prices for the energy produced from the renewables and non-conventional source. Before the NERC performed this function it was responsibility of municipalities. (Oecd & International Energy, 2006, p. 38) NERC provides updated information every month about which energy entities and projects gained the green tariffs. (Konechenkov, 2012).

Another intergovernmentally-funded actor in the field of wind energy is the European Bank of Reconstruction and Development (EBRD). EBRD was established in 1991 and is one of the biggest investors in the renewable energy sector. EBRD provides loans for different projects in geographical regions spanning from Western Balkans and Central Europe to Central Asia. EBRD is owned by 63 countries, the European Union and European Central Bank. (EBRD).

EBRD started running the Ukraine Sustainable Energy Landing Facility (USELF) to promote the business sector to continue sustainable projects. (EBRD). USELF operates in collaboration in collaboration with the Ukraine authorities and initiated the Strategic Environmental Review (SER) of renewable energy technology. The purpose of the SER is to identify key issues associated with such projects. The program was done in order to see the possible impact of the USELF platform of the environment. The platform is used in order to identify where are the optimal places for the projects implementations and to anticipate where possible problems could arise etc. (Walther, 2012) This information then can be used to guide future environmental assessments of renewable energy projects (EBRD). EBRD is doing technical financial analyses of the projects, assessments of greenhouse gases emission reduction, and evaluation of clients to ensure compliance with standards etc. (EBRD). Under the USELF program wind projects as well other related with renewables are financed and provided by technical consultations for businesses and local authorities about the project management. EBRD has plans to provide the 5 million. Euro loan to the Ukraine

government in order to encourage faster project development related to alternative energy sources (APEU, 2012)

USELF is funding 60 % of the projects costs. The interest rate for the loan provided by the EBRD for wind projects as well as for other related with the renewables could vary from 6% to 10 %, depending on the risk of the project: which means that for projects within a 6 months' timeframe the interest rate could be from 6.55% to 10.55% including Euribor (today Euribor is around 0,55 %). For the projects within a 10 months' timeframe the interest rate could vary from 6.82% till 10.82 % (Euribor is around 0,82%) (Walther, 2012).

Currently 78 applications for funding from the projects have been received. Fifteen of them are in the evaluation process (Walther, 2012). However only one project related with wind energy is currently approved and has received funding through the USELF. This wind farm will be constructed at Saryy Sambir region in Western Ukraine (EBRD, 2012). The issue is the capability of the investors to share the costs of the projects. In some cases investors create a cluster. This complicates project development. Investors have to define their responsibilities. The power within the cluster often depends on the share of investments. During the project implementation time many problems could be faced. So it might be difficult to manage project due to the friction between the coo-investors. This issue might prevent different investors with low capability to apply for the loan.

Among other actor's the Ministry of Environmental Protection is responsible for environmental protection, sustainable use of natural resources, security of nuclear and radioactive safety as well. The obligations of Ministry of Environmental Protection also comprise coordination of climate change policy, and greenhouse gases emissions reduction in the energy segment. (Oecd & International Energy, 2006, p. 37)

Today national companies are managing the energy sector in Ukraine. Governmental organizations, regional and local authorities can also have an impact on energy companies through the taxation procedures (environmental taxes tec.) or through the licensing system. (Oecd & International Energy, 2006, p. 39) They are acting and affecting entirely whole processes involved in the energy sector. Of course the level of impact is varying depending on the type of sub-sectors. Often a problem arises in the collaboration process. Experience shows that closer cooperation would be one of the important steps for more transparent bureaucracy system not only in the renewable energy sector but could help to improve whole situation in the country in general.

2.4.2 Non-governmental organizations

There are numerous non-governmental organizations working with the wind energy issue. One of the main actors related to wind energy is the non-profit, non-governmental organization Ukraine Wind Energy Association (UWEA). It is the "prime mover" in Ukraine. The organization was established in 2008. UWEA is promoting the development of wind energy in Ukraine, collaborating with the business sector in order to involve more investors for the implementation of wind projects in the country. UWEA also has a lot of partners and it works in cooperation with the scientists, politicians, private companies producing the equipment's, different researchers, customers and with all others actors who are involved in the process of wind energy implementation.

UWEA is organizing international conferences, participating itself in conferences and communicating with different regional and local administration bodies. This facilitates the sharing of information and experience. (UWEA)

UWEA is a strong organization and has a good reputation in the wind energy sector. But it is also very significant when big actors playing in the energy field are leading in the market (Jacobsson & Johnson, 2000). The progress of new technological system has to be pushed on by the actors, which are experts, have good resources, facilities and affect. It could be done by the large energy companies or equipment's providers.

Another important non-profit and non-governmental organization dealing with all renewables and with the wind energy as well is National Ecological Center of Ukraine (NECU). NECU was established in 1991 after the Soviet Union collapse, when Ukraine became independent. NECU is a strong actor for environmental protection. The members involved in NECU organization are from different sectors and have different backgrounds. They are scientists, journalists, students, artists and other representatives who want to add their own exertion in order to protect the environment. NECU has many branches in different Ukraine cities. The goal of NECU performance is to bring anxiety of the local people and specialists to the politicians in order to reform the different strategies and projects. The goal of NECU is to maintain protection of the environment, by establishing new protected zones and reducing people's impact on environment through the changes in the policy in energy and transport segments. NECU is funded from the different programs for European governments and from private sector funds. The organization is a member of CEE Bankwatch Network, NGO Working Group on climate change, Climate Action Network International etc. (National Ecological Center of Ukraine, 2007)

DTEK is one of the key players in the electricity market. DTEK belongs about 70 percent of the shares of DTYEK "Shidenergo", DTEK "Dniproenergo", Kyivenergo and DTEK "Zahidenergo". All these companies are producing electricity and supplying it to the wholesale electricity market. The total install capacity of DTEK comprises 18,2 GW. The company is one of the leading in the country (DTEK). DTEK belongs many coal

In comparison the total installed capacity in Ukraine today, which is 52 GW. DTEK controls about 35 % of the total installed capacity in the country.

2.5 Institutions

The expectation of the future is that the shares of the renewables in the energy sector will growth. According the State Agency Ukraine has a plan to install 6 GW capacity of renewables and they will share about the 12.5 % on energy balance till 2015 (Berezovski, 2012). In order to achieve this goal, the Ukraine has government made numerous steps in changing legislation structure. The Government adopted several policies related with renewable energy.

Jacobsson and Johnson emphasized that "institutions greatly affect the specific path that a technology takes". They explain that institutions could be divided or grouped in few parts: hard ones (legislation, capital market) and soft ones (culture or education) (Jacobsson & Johnson, 2000). One of the key factors for wind expansion and development are regulations and legislation provided by Ukraine government for wind energy. Below in this sub-chapter the main changes made in the Ukraine legislation toward the renewable energy are described.

The Verkhovna Rada of Ukraine established the Law of Ukraine “On Regulation of Town Building Activity” No 3038. This Law focuses determines on confirming the legal and organizational requirements for the town planning. The Law focuses on confirming sustainable expansion and progress of areas with regard to the state, public and private interest. By this law the steps which have to be taken in order to get the allowance for construction were simplified and the number of required permissions was reduced from 93 to 23. The Law set up a time frame for the processes as well. This was reduced from 415 days to 60 days. One of the main tasks of this law implementation was to ensure the transparency of information about the town planning and development (UWEA, 2011, p. 7).

According the resolution No 80, approved by Cabinet of Ministers of Ukraine on 9th of February of 2011 all energy saving materials, equipment's, devices and components which are imported in Ukraine have an exemption and suppliers are not required to pay VAT taxes for these goods (UWEA, 2011, p. 6).

The Law “On Amendments to the law of Ukraine “On Electrical Power Engineering” concerning state guarantees to promotion of the usage of alternative energy sources” No3486-VI was adopted on the 3rd of June 2011. This law prescribed that the State is responsible for ensuring security of the requirements concerning the purchase of all electricity produced from renewable energy sources at the approved “green” tariff. The law prescribed the manner in which the payment for such electricity should be done (UWEA, 2011, p. 7).

Ukraine government made a decision related to electricity produced from the renewable energy source about the raw material, works, services and fixed assets. According the changes of the Article 17.1 of the Law of Ukraine “On Electrical Power Engineering” from the 1 of January 2012 15 % of the raw material, services, fixed assets, and works have to be of Ukrainian content. This means that 15 % of the project's construction costs have to be paid for the production, works or services originated in the Ukraine. From the 1 of January 2013, this requirement rises to 30 % and respectively from the 1th of January 2014 this requirement increase till 50 % (UWEA, 2011, p. 7).

Verkhovna Rada established the Law “On Amendments to the Article 17.1 of the Law of Ukraine “On Electrical Power Engineering” (regarding determination of ratio of Ukrainian goods in value of construction of electric power industry objects)” on the 18th of November 2011 (UWEA, 2011, p. 8). The Law emphasized that requirement for 15 % covered by the origin local content for the construction projects applies to the projects which started at 2012 and needs to be completed in 31th of December 2012. The analogical requirement for 30 % applies for the projects which will start after 2013, putting into operation should be till 2014, respectively requirement for 50 % applies for the projects which will start after 2014 (UWEA, 2011, p. 8). According the procedure defined in the Ukraine legislation, after the construction work was done, the group of qualified experts has to inspect and approve, and confirming that the construction works were completed according to the requirements, defined by law. In Ukrainian legislation there is no mention about the timeframe during which the construction works have to be inspected. This means that if the experts extended the time of inspection for some reasons and will not approve the construction works until the end of 2012, the project will be prepared according defined for 2012. However there will be different requirement at the beginning of 2013, according to the law, the project not fulfill the requirements of “local content” which was mentioned above and it will be difficult or maybe impossible to approve it at all. (Konechenkov, 2012).

The law “On Amendments to the Law of Ukraine” On Electrical Power Industry” as to stimulation of alternative energy source use” was established on 1th of April in 2009. The Law specifies that the rate of “green” tariffs have to be established for each economic entity which is producing electricity from the alternative energy as to each type of alternative energy and for each object of electrical power industry. The green tariff is different depending on the capacity. The information about the list of the green tariffs is shown in the Figure 3-1

Table 2-6 Dynamic of "green" tariff rates for 2012-2030

Electricity produced with	Green Tariff, Euro/KWh						
	Year	2012	2013	2014	2019	2020	2019,31 Decemb er
				(-10%)	(-20%)	(-30%)	
National compone nt		15%	30%	50%	50%	50%	50%
Wind energy by objects with rated capacity up to 600 KW		0.0646	0.0646	0.0581	0.0517	0.0452	0.0452
Wind energy by objects with rated capacity over 600 KW but not exceeding 2000KW		0.0754	0.0754	0.0679	0.0603	0.0528	0.0528
Wind energy by objects with rated capacity over 2000 KW		0.1131	0.1131	0.1018	0.0905	0.0792	0.0792
Biomass energy		0.1239	0.1239	0.1115	0.0991	0.0867	0.0867
Solar energy: Surface power facilities		0.4653	0.4653	0.4188	0.3722	0.3257	0.3257
Solar energy. Power facilities installed on roofs of houses, buildings and constructions with rated capacity over 100KW		0.4459	0.4459	0.4013	0.3567	0.3121	0.3121
Small hydro power plants		0.0775	0.0775	0.0696	0.0620	0.0543	0.0543

Source: Berezosvki, (2012)

The Figure 3-1 shows, that the “green” tariff depends on the installed capacity. If the installed capacity is bigger the “green” tariff per kWh will be higher.

The Cabinet of Ministers of Ukraine on September 28, 2011 established Resolution No 1 005. The Resolution defined and approved a list of goods of owned production. The list covers wind generators with unit capacity 1 MW and more and wind generators with the capacity of 0.5-150 kW for independent power supply. 80 % of profits generated by company from sales in the Ukraine territory have an exemption from taxation (UWEA, 2011, p. 8).

The Law mentioned above specifies the process of the designation of the “Ukrainian content”. The “Ukrainian content” needs to be approved by the National Commission that Implements State Regulation in Energy Sector of Ukraine. According the Law Cabinet of Ministers of Ukraine should approve the procedure of issue of certification about origin of goods in order to identify their Ukrainian origin for the purpose of the Law needs to be approved by the Cabinet Minister of Ukraine (UWEA, 2011, p. 8).

However this is an institutional failure, influencing wind market, because none of these procedures were affirmed by the end of the 2011. Furthermore wind energy projects are facing complications receiving the technical specifications and applicable permissions for the connection to the grid. (UWEA, 2011, p. 8).

By the acceptances of the different laws Ukraine did huge step for the expansion of renewable energy development in Ukraine, in particular by establishing the feed in tariff. This is big incentive towards increasing energy production from renewables. But still there are many problems related with this. For example the government has a duty defined by the law to ensure buying of all electricity produced from renewable sources. On the one hand this a positive factor for renewables energy production, but in the other hand, in the policy papers there is no identification how much energy from renewables has to be consumed. So this is the big constrain for the alternative energy production in the country (Trypolska, 2012, p. 645). So today many institutional failures still happened, but they need to be further reduced as much as possible. Otherwise there is a threat that wind power sector development will be locked out.

2.6 Networks

As was mentioned in previous chapters in wind energy sector exist many different actors within the market. Jacobsson and Johanson (2000) emphasized that “with the reference of the formation networks a particularly vital element in policy is the shaping of new and strong user-supplier links.”(Jacobsson & Johnson, 2000, p. 634) Through the network appears possibility to compensate the narrowness and limitation of the actors, which shows that network is perfect instrument for the transfer of knowledge, sharing of experience, and a resource foundation. A good network ensures increasing connection between fragmented consumers and helps them to frame their latent demand, improving the functioning of the market. Some of the actors, playing an important role in creation of new energy system, are very powerful, while others are poor and don’t have enough resources. So well an organized network is a bridge for them helping to reduce their limitations and increased capacity in terms of experience, knowledge etc. (Jacobsson & Johnson, 2000, p. 634).

Conferences are one of example related to network creation. By participation in the conferences actors, such as UWEA are gaining and sharing the additional knowledge and experience. UWEA not only organizing conferences, but also participate itself, increasing their influence and providing the information about the existing situation in Ukraine, challenges faced by wind sector, about the driving policies in the country, and spreading information to different actors about incoming events. The webpages of actors are playing big role in the network creation system. In the websites they could find the newest information. Using the network appears well increases possibility to spread news about the governmental forecasts related with renewables not only about the Ukraine, but also about the information related with the energy sectors from different countries. So in that case UWEA is very dynamic in the creation of the connectivity network. The company is very

active and dynamic in terms of the connectivity network creation, but still finds it is difficult to affect the governmental decisions and promote a strategic view related with the renewables without support of any others leading actors in the market.

Another important actor in terms of wind energy is REC. REC is doing research about the renewable energy in Ukraine. In 2011 REC published the marketing research about the “Wind energy market in Ukraine”. They also did an evaluation of capacity and emphasized the prospects for development of the Ukraine industry, production, and an analysis of the large scale projects and mounting of wind power equipment (Renewable Energy Center, 2010).

Network creation is a continuing process. The highest number of actors (governmental bodies, non-governmental bodies, private companies) involved in the network would increase the competitiveness in the market. Due to their experience and knowledge the wind energy sector could reduce constrains and increase the share in the market. However, in practice it was observed that often governmental organizations are not working in collaboration. Sometime they have different interest and in some cases they are not interested in creation of a good connection, communication and share information. So in that case, some actors from the other side are very useful. Such type of actor is NECU. NECU is very dynamic in terms of the building connections. NECU is not accepting any funding from the political parties and business corporations and this is strong and powerful organization in terms of different policies and strategies review. When Ukraine government prepared the draft of Energy Strategy to 2030, NECU strongly criticized it. The organization claimed that “updated Draft of Energy Strategy of Ukraine to 2030 is based on unrealistic predictions of economic growth and electricity consumption. This can lead to inefficient spending of taxpayers money and irrational use of energy source.”(Nacional Ecological Center of Ukraine, 2011). The strong independent organizations are an important element in terms of being able to voice independent opinion in the network creation.

As can be seen from the information described above network mainly exists between the private companies, investigation institutes and researchers. But in order to increase the advantages and power which could be provided by the well-connected network, needs to be more governmental support and it needs to reduce the influence of the old players which often are powerful lobbying energy companies who are not interesting in the renewable energy development.

3 Political, economic, social and technological barriers for wind energy

3.1 Political aspects

3.1.1 Barriers

There are a lot of barriers and constrains which impede wind energy development in Ukraine. Many of them are related to the uncertainties in the policy and legislations. The law about the “local content” creates many ambiguities. This law requires that the share of the local content (originated from the Ukraine) must be 30% and 50 % respectively in 2013 and 2014. This is huge constrain if the project is late and implemented on the time given, and the project is prepared according to the requirements for the year of 2012, but the object is not ready to be until after the January 1, 2013 becomes nearly impossible to launch the wind plant in 2013, while the requirement for the “local content” increases to 30%. The same situation would apply to the projects (50%) that would fail to be completes at January 1, 2014.

The law about the “local content” leads to another issue. In the existing governmental documentations there is no explanation how evaluation of local content has to be calculated, which means that additional requirement needs to be prepared. These uncertainties in the evaluation process create huge misconceptions and make the field for the conflicts and abuses during the project implementation period. It will be very complicated to prove that exactly 30 percent of works or goods or raw materials are originated from Ukraine, since there is not quit clear how it supposed to be calculated. For example in 2014 this requirement increases till 50%. To cover this requirement will be quite difficult. It's half of the possible project price. Foreign investor might need to find local partner for this reason. This issue could be quite complicated if the time for the project proposal will be too short. So in reality this might cause that for the companies could receive the green tariff if the project started after this law was established. By this reason the projects are locked. If the procedures for the “local content” would not be prepared as soon as possible, appears threat that Ukraine could not reach the obligations to European Energy Community to reach 12% of shares of renewable energy in total energy production. The local content requirement applies for all type of renewables.

Ministry of Regional Development is responsible for the inspection, of the construction works and the quality of the wind turbine. However today there are no licensed experts capable of executing proper inspections. Mr. Konechenkov says that The Ministry of Regional Development has not approved the procedure how it should be done (Konechenkov, 2012). It means that today none of the projects which have been started after the adoption of this law can't receive the permission for the green tariffs. The Cabinet of Ministers of Ukraine has initiated the process of set requirements for the licensing of experts. And yet the time frame is not clear for this procedure to be completed and approved by the government. On the other hand, it seems that the problem is solved once the procedure of licensing is finished and adopted. Nevertheless the fact is that this issue was less complicated before the licensing(Konechenkov, 2012).

When the company which was implementing the wind farms project, would sign the contract with the wind turbine supplier, company could immediately apply a request to receive green tariff. After the connection to the grid has been completed there were no more obstacles for

the electricity supplier to receive green tariff (Konechenkov, 2012). It seems that earlier procedure was simpler, but in reality it is difficult to judge which solution is better. Since once the construction approved by the qualified experts, provides some sort of guarantee that the construction was made according to the requirements. In theory this means that responsibility for the flaws during the construction and connection and connection phase will be shared between the qualified experts and the company. In other words, it is kind of double control process when unbiased supervisors look after the works of private company. On the other hand additional supervision procedure could create bureaucracy issues. At time it leads to the distortion of the normal practice and creates circumstances of the unfair competitiveness, related to the bad practice of bribing that still common in the Eastern-Central Europe. Practically this is means that supplementary requirements could generate both the benefit and additional obstacles.

The vagueness and ambiguity is very common in term of regulations. Sometimes is impossible to predict what kind of consequences the law could have. For example, when there is no prescribed procedure for who has to provide maintenance services for the wind turbines could lead to the spoil of them, which could require shutting down the plants. However, for the country which has not enough experience, the good existing network might allow to avoid such problems or to reduce the negative consequences.

The misuses in the state owned companies, shows that government faced problems with lack of the regulations and transparency, how companies has built their performance. It looks strange that Ukrenergo repealed their applications without any evident reason. It seems that ability of the companies to connect to the grid, are provided by law. However in reality is not always happening.

Exist another side of the coin. The technical problems with grid capacity in some regions don't allow doing that. So this is duplicitous situation. In the one hand according to legislation energy produced from the renewable energy has priority and has to be accepted to the grid; in the other hand appears technological issues. Special funds or renovation and upgrading programs could help to change the situation; however this is required huge investments. Without governmental financial support in practice is impossible to do that.

The uncertainties related to "local content" concept leads toward, the monopolization. Mainly only big companies (prime movers) have possibility start wind project development. Big companies often have huge resources and can invest in the local production. So in such circumstances market is distorted, because there are no enough competitors who could regulate the market.

The concept of "local content" requirement today is the most restricting regulation not only for the wind energy, but for all renewables in general. Many projects are facing huge difficulties for this issue. This is blocking the renewable energy development in the whole country.

Political situation is one of the key factors playing an important role in the market regulation process. Frequently policy makers are producing the laws that are useful for some lobbying groups. And often these groups are standing behind the government. Politicians are being manipulated like a tool. In the world corruption rating Ukraine dropped down from the 134th to the 152th position during the period of 2010 till 2011. It is difficult to change situation quickly. Practice shows, that many Eastern Europe countries had the same problem at the beginning phase.

3.1.2 Drivers

European Energy Community requires that Ukraine would increase the shares of the renewables to 12% share by 2020. According to the updated draft of “Strategy till 2030” country has plans to install additional renewable energy capacity of 9 GW. Wind comprises the biggest part - 5600 MW. This requirement puts a pressure on Ukraine to accelerate the wind energy penetration, as well as other renewables into the energy market.

Green tariff is a significant factor encouraging companies to invest into the wind energy. This incentive provided by government is one of the main drivers for the wind energy development.

Green tariffs offer higher revenue for the projects related to renewable energy and guarantee a long-term income stream. This allows less-competitive projects to become more attractive to investors (EBRD, 2011b).

However, Ukraine should establish higher prices for energy consumers who use fossil fuel based electricity in order to encourage investments in renewable energy. This would create some obstacles for the nuclear and fossil fuel based energy and would make wind energy more competitive

3.2 Economic aspects

3.2.1 Barriers

It is a political decision to provide subsidies and to keep prices for electricity in the low level. The willingness to be reelected for the next term is one of the reasons why politicians are still subsidizing this sector. Low prices for electricity are influencing society’s opinion. However, it has negative impact from the economic point of view. On the one hand government is covering the production costs for electricity produced from fossil fuel. On the other hand government subsidizes wind energy market with the green tariff. This double economic intervention increases the gap in the budget and in the long term could have crucial affect on the country’s economy. Reduction of subsidies for energy produced from fossil fuel would cause an increase of electricity price. The residential and industrial sectors in that case would pay higher prices for electricity. This solution might not look very attractive for the society at first. However, this change might encourage consumers to choose renewable energy instead of the nuclear or produced from fossil fuel. This would accelerate the wind energy penetration into the market. It would also help to encourage the implementation of process and practices that will reduce energy wastage.

Another constraint arises as a result of the adopted law on the mandatory share of “local content”. Today the market in Ukraine faces a problem of the distortion. Only one manufacturing mill with capability to production technology for wind turbines is presently operating in Ukraine. It might be impossible or difficult to increase the quality of the production, since there are no other mills that could compete within the market. In other words there is no incentive to do that.

The investments are playing a crucial role for the project development. Wind project developers must supply project documentation to the bank for the project assessment in order to receive the funding. Banks have their own evaluation method and specific requirements for these projects. It often includes risk assessment, payback period, and timeframe for the period of the loan etc. Some could wonder what is the situation in Ukraine

from the banks' prospective? During the project assessment, experts representing banks might easily repeal the application. This is possible because equipment of higher quality are often more efficient. From the economic point of view it might generate higher revenue and create less problems in terms of technology (it has a longer expire date, less failures etc.) Banks are assessing these risks and would not provide loans once they realize that developers are using the technology of a lower quality that doesn't meet the new existing standards. Such a situation has locked in the growth of wind projects and this is major obstacle for the further development.

EBRD is an organization that provides loans for the wind energy projects. Yet, one of the rules requires that USELF funding share should not exceed 60 % of the investments for the projects. The remaining 40 % must be covered by the investor. It means that investors have to be financially well capable in order to prove their ability to fund 40 % of the total costs. However, the biggest and richest industrial companies, such as DTEK which has a share of 35 % of the total electricity production, are mostly related to the fossil fuel and metallurgy production. Very often these companies are not interested in renewables, since the current energy market situation is generating a significant profit for them. All in one, possibly local investors are not willing to invest in this sector, while foreign investors face the problem related to the "local content". It continues as a closed loop.

EBRD is an organization which is provided loans for the wind energy projects. Yet, one of the rules requires that USELF funding share should not exceed 60 % of the investments for the projects. The rest 40 % must be covered by the investor. It means that investors have to be financially well capable in order to prove their ability to fund 40 % of the total costs. However, the biggest and richest industrial companies, such as DTEK which is shares about the 35 % of the total electricity production, are mostly related to the fossil fuel and metallurgy production. Very often these companies are not interested in renewables, since current energy market situation is generating a significant profit for them. All in one, possible local investor are not willing to invest in this sector, while foreign investors face the problem related to the "local content". It reminds a closed loop.

There is another issue. Local banks are providing loans for the projects with an interest rate as high as 18% or 22 %. The credits rarely exceed five years, while in some number of cases the payback period for the project is longer than that. (Trypolska, 2012, p. 650). So the short time frame to return the loan creates another risk for the investors.

After the collapse of Soviet Union, Ukraine industry was shrinking significantly, however the emissions permits were left at the high levels of 1990. Although since then its Economy has been experiencing an overall growth, today Ukraine has enough unused capacity for the increasing emissions. The country is selling their permits to the states that find themselves in a more complicated situation and are lacking these permits. On the other side it also could be driver for the renewable energy. Increasing renewable energy could offer more emission rights for sale. So Ukraine could get more revenue for renewable energy development.

Today the government subsidizes energy sector that is being run on the fossil fuel. This economic instrument creates a huge obstacle for the further wind energy development. There are not many incentives for the energy consumption to switch to renewables because a share of the conventional energy cost is being covered by the government. This is one of the major obstacles discussed "Ukraine energy policy review 2006" (Oecd & International Energy, 2006, p. 27).

3.2.2 Drivers

EBRD decision to establish the USELF platform is one of the encouraging elements in the field of wind energy development. The interest rate for the loan provided through the USELF is lower compared to that of local banks. The differences of interest rate between the local banks and EBRD loans could vary from 11% to 16% depending on the project conditions. The interest rate for the loans provided by EBRD is more attractive to the investors. EBRD offers free technical consultations for project developers from local and international experts, under the USELF as well. This assistance helps to increase the level of knowledge, promotes networking and prevents flaws during the project preparation phase. However, at times it is complicated to find competent experts. In practice there are some specific requirements for projects management and if the expert doesn't have enough knowledge or skills, some major mistakes could occur. As a result this could cause some negative impacts for the projects. In some cases project developer could even be fined. USELF also helps to prepare the required documentation in order to receive the loan. Trainings for the projects developers have an additional value which will be useful in the future.

Under the USELF platform EBRD will provide 50 million Euro investments for renewable energy projects. Assuming that 1 KW of wind energy installed capacity cost 1,227 Euro. approximately 41 MW of wind energy could be installed using these investments (EWEA). It would comprise about 27 % of total installed capacity by the end of 2011. So investments might accelerate the diffusion of renewable energy a lot.

3.3 Social factors

3.3.1 Barriers

Wind power plants have various impacts in terms of social opinion. Local residents often are afraid of neighboring wind power plants. There is a common opinion that wind farms create much noise and negatively impact local flora and fauna; however this depends on many different factors. The lack of knowledge on renewables and the global warming, creates constraints for the wind energy.

People are aware that wind farms might have a negative impact on the landscape or that it could visually look unattractive. Some of these fears are true. Turbines that are 100 m in height could be seen from a distance of 30 km. It protrudes above the tree line and in some cases people thinks that it could destroys the natural view. It could also cause the loss of habitat for the wild animals and birds. (EBRD, 2011b). However, the negative impact of wind turbine could vary depending on the region where it is constructed. At times it seems that the social awareness for the wind turbines are too high and does not reflect the real situation, especially, when damaging impacts of fossil fuels and nuclear systems are often forgotten.

There is another social issue that comes along the negative opinion on the wind energy. It can be tracked back to the recent past in the history. During the times of Soviet Union the price of electricity was rather low. People did not care from which type of fuel source electricity was produced nor how much of it was wasted. Personal reflection is residents' attitude towards the energy wasting has not changed much up to these days. Consumers do not see a reason to reduce the consumption and to change their habits since "it has always been like that".

3.3.2 Drivers

The social awareness is an important factor in terms of the renewable energy expansion. Awareness about the nuclear energy is influencing understanding about the positive aspects of wind energy. Media is playing one of the important roles in that case. Today technologies are capable of spreading information very fast. Many decisions made by the society depend on the different situation. However, often a part of the decisions are made under the impact of media. Media might shape habits and behavior of people. It can be positive or negative as well. This is a very powerful tool. On the one hand it encourages society to be involved in discussion about the worsening environmental conditions, air pollution, health issues etc. In many cases people wouldn't receive information on relevant environmental issues. Most people remember the recent Fukushima disaster and its consequences, yet without the media performance half of the world wouldn't even know that such an accident ever happened. Media did not inform about Chernobyl disaster. When it happened most of the information was hidden, due to the policies of the Soviet Union. There are many different aspects of media's effect on society.

Wind energy sector development might offer new job places. The wind energy can improve the welfare of the rural areas. Skilled experts are required for the maintenance of power plants. So it makes the training course a necessity, especially in regions where the wind power has not been implemented yet. This necessity is likely to involve educational sector in the process. All in one, this is a chain reaction, which generates positive image for the wind projects and helps to develop regions economically.

3.4 Technological

3.4.1 Barriers

Ukraine does not have a capability to produce wind turbines locally. The transportation of the wind turbines at times creates big obstacles. Wind towers could be quite tall. Its transportation is not an easy task to do. In particular when there is a lack of proper infrastructure. It can be transported by the sea. However it could have some problems as well. This could depend on the weather conditions a lot. It also requires specific equipment's.

The big technological obstacle comes with the grid connection and its transmission capacity. In some parts of Ukraine the huge potential of wind cannot be taken advantage of simply due the grid that has not enough import and export capacity. This situation could be changed and the grid capacity could get increased, but this would require significant investments. Ukraine might also need backup technologies. It's difficult to predict the weather conditions such as wind speed. Yet, the efficiency of wind turbine depends on these factors. In such a case there might be a need to build or to upgrade gas power stations in order to balance the load fluctuations. Backup technologies could reduce the technological problems related with load balance, but this might require additional investment which creates another economic issue.

3.4.2 Drivers

One of the solutions for the strategic investor is to start a local manufacturing of machinery for wind farm. On the one hand this is a big constraint, that requires long-term investments, on the other hand this could become a successful front runner move in the big market. Foreign manufactures have longer experience and better technology. If major producers would transfer their production to Ukraine they could easily compete with the outdated local technology, while the "local content" requirement would guarantee the profitability.

4 Conclusions

Global policy in terms of the use of renewable sources for the production of electricity is more targeted today than in the past. And yet for developing countries this market is still not well developed and requires huge investments. The wind energy sector is in its initial phase when it comes to development; while the market in the developed countries is more developed. The Ukraine market has already attracted few investors such as JSC “Fuhrländer” AG, however there is much room for improvement. The goal of the thesis was to identify the drivers and barriers for the potential investors. Legal and institutional policies and strategies specify conditions of development and identify rules of play in such a way that they pose both considerable drivers as well as barriers for wind energy sector development.

Uncertainties in the legislation, and complicated licensed procedures creates financial and bureaucratic obstacles for investors. This could reduce their interest in the Ukrainian market or it could cause them to choose another country, which may look more attractive for the investments. Higher institutional support for these projects will help to increase their expansion and development. The collaboration between the private and public sectors is a crucial factor in such situation.

The discrepancies in the law have a negative impact. One discrepancy, for example, is related to the “green” tariff. The green tariff could provide benefits ; however another discrepancy is in the “local content”. This big obstacle for bringing this benefit, there is no properly prescribed procedure in the law on how to calculate local content.

Low electricity prices for the residential sector, made by governmental subsidies, and continuing policy toward nuclear and fossil fuel energy are big obstacles for the green electricity, preventing wind energy sector development.

The thesis includes an analysis using PEST (political, economic, social and technological) tool. Lack of knowledge and the inability to understand the advantages, which could be offered not only by wind energy but in general with renewable energy sector development, could lead the country to increasing its problem related to the migration of motivated young people abroad.

Nevertheless the biggest constraint, which was found during this research, is related to uncertainties in the governmental position in terms of renewables in general, which creates a huge barrier for the successful investments in the wind energy sector development. This is mainly due to the large differences in terms of understanding energy security within the different governmental organizations. Governmental bodies, such as Ministry of Energy and Coal Industry, see the opportunities for the investments in the coal sector, which in the short term stimulates economy and helps to make society more stable in terms of job creation, for instance. However, the government with such approach eliminates the possibility for local communities to live in a more sustainable energy environment, which renewable energy can offer. This governmental approach could have two sides: one side could be that this governmental attitude will have a positive aspect in the short term perspectives, however in terms of long perspectives this could be economically wrong decision. Ukraine could lose huge amounts of investments related to green energy, as well as the possibility for establishing new green zones, recovering polluted mines areas, technology transfer and rural area development. The main identified barriers and drivers related to legislation are presented below.

Drivers

1. The Law of Ukraine “On Regulation of Town Building Activity” No 3038. This Law determines the legal and organizational requirements for the town planning. By this law the allowance for construction were simplified and the number of required permissions was reduced from 93 to 23. The time-frame for the permissions receiving procedure was reduced from 415 days to 60 days (UWEA, 2011, p. 7).
2. The Resolution No 80, approved by Cabinet of Ministers of Ukraine on the 9th February of 2011. All energy saving materials, equipment, devices and components which are imported to Ukraine have an exemption and suppliers are not required to pay VAT taxes for these goods (UWEA, 2011, p. 6).
3. The Law “On Amendments to the law of Ukraine On Electrical Power Engineering” No3486-VI was adopted on the 3rd of June 2011. With it State guarantee to purchase electricity produced from renewable energy sources at the approved “green” tariff (UWEA, 2011, p. 7).
4. The Resolution No 1005 approved by Cabinet of Ministers of Ukraine on 28th September 2011. The Resolution defines and approves a list of goods of owned production. The list covers wind generators with unit capacity 1 MW and more and wind generators with the capacity of 0.5-150 kW for independent power supply. 80 % of profits generated by company from the sales in the Ukraine territory have an exemption from taxation (UWEA, 2011, p. 8).
5. Low interest rate for the loans and free technical consultancies provided by EBRD.
6. Social awareness about the negative impact of nuclear and fossil fuel.
7. Regional development by the creation of new jobs and local manufacturing.
8. The analysis of policy and legislation show how important legislation is at the beginning of the wind energy development. Guided by the requirement to fulfill its obligation for the European Energy Community, Ukraine has to reach at least a 12 % share of the renewable energy sources in its energy balance by 2020 (Berezovski, 2012; foRum, 2012).
9. Wind energy potential development will help Ukraine to fulfill this obligation and increase its energy independency. Wind energy will allow the country to reduce its energy imports and will create an environment for sustainable development.
10. Additional wind farms can contribute to healthier society, to the generation of revenue to the state budget, and to better living conditions in terms of clean environment – especially in the sensitive communities.

Barriers

1. The law “On Electrical Power Engineering” (concerning terms for stimulations of electricity production from alternative source of energy”, specifying what part of the project cost should be spent on the raw materials, some works, goods and services

- originating from the Ukraine (in 2012 - 15%, in 2013 - 30%, in 2014 - 50%) (UWEA, 2011, p. 7).
2. The “On Amendments to the Article 17.1 of the law of Ukraine “On Electrical Power Engineering” (regarding determination of the ratio of Ukrainian goods in the value of construction of electric power industry objects)”. If the project was prepared according to the requirements for 2012, it means that wind turbine has to be put into operation not later than 1 of January, 2013. The same situation applies to projects that are launched in 2013 and 2014 respectively (UWEA, 2011, p. 7). If the project apply for the requirements related to 2012 (15 % local content) and the equipments’ will not be decommissioned till 1 of January 2013, the project will not be completed about, since in 2013 the “local content” requirement increases till 30%.
 3. The procedure for the “Construction Project Approval and State Expertise” introduced by the Resolution of the Cabinet of Ministers of Ukraine No 560, May 2011. This procedure requires that the inspection of construction projects must be done by qualified experts. (UWEA, 2011, p. 7) Today there are no prescribed regulations and procedures for the licensing of these experts.
 4. Monopoly in the energy market and lack of support from the government: this creates a huge obstacle for the investments. Fossil fuel sector subsidies by government are discouraging the attractive conditions for the investments in the wind energy sector.
 5. Adopted law on the mandatory share of “local content”. Today the market in Ukraine faces a problem of distortion. Only one manufacturing mill with capability of part of wind turbine production is presently operating in Ukraine.
 6. Limit of capable investors to cover 40% of the total project costs. The rest could be funded by EBRD.
 7. High interest rate provided from local banks. The interest rate vary from 16% to 22%, while interest rate provided from EBRD vary from 6,55 % to 10,82 %.
 8. Negative social opinion and lack of knowledge about the benefit provided by wind energy.
 9. Restricted grid capacity. In some areas the grid export and import capacity is low.
 10. Emission rights for sale. Could be both – a barrier and a driver.

The liberalization of wind energy market may reduce the influence of barriers described above. This could lead to a more attractive and appropriate climate for the wind energy investments. Moreover, the ability to realize the opportunities offered by the development of this segment and further investments in this sector will help Ukraine to achieve more independence from fuel import and ensure energy security. Finally, further development of wind energy could offer further progress on potential of technology. In addition, the prices for wind energy as well as for some other renewable energy technologies are decreasing all around the world. This would makes wind energy more competitive in comparison with the conventional type of energy. The time is playing an important role in terms of wind energy investments. The essential reforms and supporting instruments are necessary conditions for the project development. Therefore, all interested parties have to bring together their energy

and push their efforts and capacities for the investments realization in order to ensure local sustainable development. If they will not grab this possibility, the country might lose big opportunities that could lead to the creation of more sustainable energy system for the future generations.

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