MSc Program
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The Influence of Wind Energy on the Romanian energetic and economic sectors on the background of the legislative framework

A Master's Thesis submitted for the degree of
"Master of Science"

supervised by

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Vienna, June 2011

Affidavit

I, **DANA MARIA BOGDAN**, hereby declare

1. that I am the sole author of the present Master's Thesis, "THE INFLUENCE OF WIND ENERGY ON THE ROMANIAN ENERGETIC AND ECONOMIC SECTORS ON THE BACKGROUND OF THE LEGISLATIVE FRAMEWORK", 105 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and

2. that I have not prior to this date submitted this Master's Thesis as an examination paper in any form in Austria or abroad.

Vienna, 10.06.2011

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Signature

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List of Abbreviations

ANRE	Romanian Energy Regulatory Authority
CTA	Commission for the Technical Analysis
EDP	Energias de Portugal
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EU	European Union
GCD	Groupe Concorde Developments
GD	Governmental Decision
GW	Giga Watt
ISPE	Institute for Studies and Energetic Projections
MS	Member States (of the European Union)
OTS/ETS	Transport and System Operator
RENEL	National Electricity Company
RES	Renewable Energy Sources
RWEA	Romanian Wind Energy Association
SEA	Strategic Environmental Assessment
TW	Tera Watt
UCTE	Union for the Co-ordination of Transmission of Electricity

Abstract

In the last couple of years Romania has witnessed a major change on the renewable energy sources market, in particular in regard to wind energy. Supported by appropriate legislation, the interest of the investors was materialized in a large number of wind farms constructed mostly in the South-Eastern part of Romania and an exponentially increased number of wind energy GW delivered to the national power grid. Although the Romanian authorities are lacking a solid base in what previous experience in the field of wind energy is concerned, the sudden escalation of wind energy production is expected to have a sustainable development and to help Romania, together with primary energy and other renewable energy sources, such as nuclear energy, biomass and hydropower, to become one of the most important energetic poles in South-Eastern Europe and to consolidate its position as one of the top ranked energy security countries in the EU.

This paper analyses the impact of wind energy on the economic and energetic sectors of the country, looking at both technical and economic variables and aims at understanding whether the wind energy boom can be supported in the future, at what proportions and to what costs. The background provided for this analysis is the transposition of the European law in regard to the Environmental Impact Assessment Directive into national law and the obstacles that might be associated with it. The paper shows, on the one hand, that there are still a considerable amount of improvements that need to be made, for a steady functioning of all sectors influenced by wind energy, and, on the other hand, that used in a controlled manner, wind energy could be regarded as a win-win situation of Romania (green energy produced and funds attracted).

Introduction

The global wind energy industry continues the expansion it started a few decades ago while the pace of installations still needs to accelerate in the attempt to combat climate change. Europe was and still is the continent that dominates the global market and top-ranked countries in the field of wind energy generation, such as Germany, Denmark or Spain, together with the United States, have the highest total installed wind power capacity in the world. In the last few years big efforts were made also by other continents and they have joined the endeavours of Europe to make a difference in climate change concerns. North America and Australia have increased considerably their share of renewable energy sources and in particular of wind energy in the total energy mix, however, at a smaller pace. Romania joined the efforts, starting with last year, when it began making use of its enormous wind potential, and to generate more green energy to the consumers. It is considered that, if the pace of development follows the predictions, starting already with 2020 Romania could occupy one of the leading positions in Europe in terms of wind energy production.

The purpose of this work is to describe the current energetic situation of Romania, focusing on the Renewable Energy Sources and in particular on Wind Energy and to understand the relation between the recent expansion of this type of energy source and the economic and energetic sectors of the country. An important role in the process is played by the legislative framework and the directions which should be followed, as imposed by the European Union, as well as by the modalities of how these directions were merged into the Romanian national legislation and the influence they might have on the development of wind energy industry.

The paper is in such manner conceived that no previous knowledge is required; however, the level of information ranges from manageable explanations of the processes involved in the production of wind energy up to more detailed technical data and storage systems particularities, addressing thus both experts and non-expert interested readers.

My main motivation in writing this thesis represented the recent considerable increase of the number of wind farms constructed on the Romanian territory, the growing interest of foreign investors to find a spot on the Romanian wind energy market and the potential the country might develop, as a consequence of the forecasted enlarged production of energy, be it from wind power, hydro power, biomass or nuclear energy.

1. Basics and the Current Situation of Energy in Romania

There are two major moments in the recent history of Romania that have marked important changes not only in the political and social system of the country, but also in its energetic and environmental behaviour.

The 1989 Revolution is a point of reference in all areas of the Romanian society, a moment that has transformed the very core of the Romanian community; apart from the major step forward towards democracy, the Revolution involved important changes in terms of economic restructuring, privatization and the introduction of market economy mechanisms, that represented the key factors during the transition period. Great reforms occurred also in the field of energy supply and demand. The cut down of the old factories and polluting industries meant, in the first place, a reduction of emissions, extremely necessary for the conditions and targets imposed later on by the European Union and stringently needed by Romania, in its position as a candidate country. On an overall budget, the total primary energy consumption was reduced in the post Revolution decades and the attention of the authorities channeled bit by bit on the potential of renewable energy sources (RES).

The second representative moment was always regarded as a significant step towards the development of the country and was welcomed by the entire Romanian society: the accession of Romania to the European Union. 1 January 2007 was a crucial moment for most political, economical and social fields of the Romanian system. Of course, the pre-accession period opened the challenging way Romania had to face in order to comply with the European norms. The period was regarded, as in all cases of pre-accession, as a training session of the country for the more strict rules of the European community. Some of the major changes that occurred, and that are relevant for our discussion, relate to the reforms made in the field of environmental and energetic legislation and those of environmental concern. Romania had to comply with all the conventions, agreements or protocols agreed at European Union level and, therefore, it had to improve its legislative system up to the point where it became able to translate the European legislation into national legislation. Also important adjustments were required in all fields of the organizational system of the country, so that the state would be able to adopt all the present and future requirements imposed by the European targets.

The purpose of this paper is to analyze the changes occurred in the energy sector of Romania through the increased exploitation of RES and in particular of wind energy, and in the same time to focus especially on the future developments of the energetic market and policies of the country, in regard to the various directives and targets imposed precisely by the European Union and in general by the global community concerning the reduction of greenhouse gas emissions. I will, therefore, detach myself from the recent history of Romania and its implication on the political and economic system of the country and I will concentrate on more precise figures that will help me understand the role of RES, and in particular of wind energy on the Romanian economic and energetic market.

1.1. Consumption, Supply and Energy Security in Romania

As described before, Romania witnessed a major change in the immediate post Revolution period in terms of total primary energy consumption. The changes in the economic sector, together with the policy adopted by the government of that time, to close down all the non-efficient enterprises have resulted into a considerable decrease of total primary energy consumption from 12000 MW in 1989 to 9000MW in 2007[1].

[1] Energetica, Nr. 11, Noiembrie 2008 – *Integrarea centralelor eoliene si calitatea energiei electrice in Sistemul Energetic National din Romania* – IRE – Insitutul Roman pentru Studiul Amenajarii si Folosirii Surselor de Energie

However, in the last three years, a slight increase in the total consumption was notable in Romania, with 4.3% growth in 2010 as compared with the previous year[2].

As in other countries, also in Romania the industry accounts for the most energy consuming sector of the country, with 40% share on primary energy consumption. Romania always relied on its domestic resources, covering up to 74% of primary energy supply from natural gas, oil and solid fuels. Rich in terms of the variety of domestic supplies, Romania finds itself below the EU-27 average in terms of dependency on imports, and enjoying in this regard a higher energy security as compared to other EU countries. Together with Poland and the Czech Republic, Romania occupies the leading positions in the ranking of the least energetic dependent states of the EU[3]. In 2005, the share of net energy imports on gross energy consumption was 27.4%[4], with imports coming mostly from the Russian Federation and Kazakhstan in form of crude oil. However, for the next ten years, the energy security situation seems to change as the imports of energy are expected to rise, mostly due to the delays occurred in the commissioning of the new nuclear power reactors in Cernavoda (Reactor 3 and 4), on the one hand, and to the European rules that have resulted in the closing of several old coal power plants, on the other hand. As forecasted by the Romanian authorities[5], the Romanian energetic sector requires a replacement or even closure of almost one third of its total old power plants by the end of 2020.

The data published by the National Commission for Prognosis of Romania[6] show that starting with 2009 there is a downward trend in primary energy production of Romania that will become even steeper after 2013. In the same report, the Commission concludes that imports will fall sharply as compared to 2005 and that they will most probably increase slightly as of 2013. The tendency towards increasing the natural gas imports it is

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2 National Institute of Statistics, *Monthly Statistical Bulletin*, 12/2010, Bucharest 2010, pg 53

3 Romania, Poland and the Czech Republic could have to increase electricity imports over the next 10 years http://www.actmedia.eu/2011/02/03/

4 Leca. A, Musatescu V., Paraschiv D.M., Voicu R., Marinoiu A.M. (2009) 'The impact of the implementation of the Energy-Climate Change package on the Romanian economy', European Institue of Romania

5 www.mmed.ro

6 http://www.cnp.ro/user/repository/prognoza_primavara_2011.pdf

considered to be triggered by the increased consumption of natural gas and by overexploitation of natural gas reserves, which resulted in a depletion of the reserves. It is considered that the share of total imported natural gas on total consumption will increase dramatically in the next period, growing from a value of 20-25% for the period 1999-2002 up to 60-65%[7]. The share of imports (14%) was significant for the registered increased energy resources of 2010 as compared to previous year; the total figure of overall 39 TWh represents a 1.5% increase as compared to 2009, which is due not only to the imported quantity of energy but also to the enlarged hydropower production, by approximately 20%[8].

Comparing Romania with other countries or with other zones of reference it is evident that the South-Eastern European country has one of the lowest specific consumption per capita. The table below (table 1) presents not only reduced figures of the per capita consumption in Romania, but it also points towards an increase in the consumption for the public sector, that has to be made at the same pace with the improvements in the energetic performances of the infrastructure.

Table 1Energy consumption per capita, in Romania and some other countries/regions

Country, region	**Specific consumption – kWh/capita**
Romania	2.200
Hungary	3.200
Czech Republic	5.200
EU	6.800
USA	14.820

Looking into the future, the Romanian National Plan for Action in the field of Renewable Energy Sources[9] has made some prognosis regarding the production of electrical energy.

[7] Frameworks and market specifics related to renewable energy sources utilization in specific CEE countries (Bulgaria, Czech Republic, Romania and Slovakia), January 2008, L'udovit Sluka, MSc Program, Renewable energy in Central & Eastern Europe, CEC, TU Wien.
[8] National Institute of Statistics, *Monthly Statistical Bulletin*, 12/2010, Bucharest 2010, pg 53
[9] Planul Naţional de Acţiune în Domeniul Energiei din Surse Regenerabile (PNAER), Bucuresti 2010 (15)

The strategy aims at covering the energy demand in short and medium term at the lowest price possible and increasing the energy security of the country by lowering the imports. Table 2 presents the prognosis for the production of electrical energy up to the year 2020, pointing at the main sources of electrical energy production, RES, nuclear and thermo power plants, which make up the total production of electrical energy.

Table 2 The prognosis for the production of electrical energy (expressed in TWh)

	2005	**2008**	**2009**	**2010**	**2011**	**2012**	**2015**	**2020**
Electrical Energy production **form RES**	20,21	18	19,5	21,7	22,3	23	26	32,5
Electrical energy produced in **nuclear power plants**	5,54	10,8	10,8	10,8	10,8	10,8	21,6	21,6
Electrical energy produced in **thermo power plants**	33,66	36,7	37,4	38,1	39,1	40,7	41,9	45,9
Total production of electrical energy	**59,41**	**65,5**	**67,7**	**70,6**	**72,2**	**74,5**	**89,5**	**100**
Gross domestic **consumption** of electrical energy	56,48	62,5	64,2	66,1	67,7	69,5	74,5	85
Share of energy from RES in the total domestic consumption (%)	35,8	28,8	30,4	32,8	32,9	33,1	34,9	38,2

The Romanian National Institute of Statistics publishes monthly a statistical bulletin[10] that presents the economic and social evolution of Romania for the respective year/month with various short-term indicators. According to the last series of 2010, Romania counted on the following main resources of primary energy. The table below presents also the imported petroleum products, as well as all types of imported energy.

[10] National Institute of Statistics, Monthly Statistical Bulletin, 12/2010, Bucharest 2010, pg 53

Table 3 Main Resources of Primary Energy during 1.I-31.Xii.201[11]

	1.01.-31.12. 2010			**1.01 – 31.12.2010 as compared to 1.01.-31.12.2009**					
				Differences			**in %**		
	Total	**Production**	**Import**	**Total**	**Production**	**Imports**	**Total**	**Production**	**Imports**
	Physical units								
Net coal (th. Tones*)	31.739,1	30.778,7	960,4	-35,1	+162,7	-197,8	99,9	100,5	82,9
Crude oil (th. Tones)	9.989,2	4.167,6	5.821,6	-1227,1	-154,8	-1072,3	89,1	96,4	84,4
Natural gas (15°C Mill. c.m.)	12.865,8	10.586,8	2.279,0	+19,4	-271,9	+291,3	100,2	97,5	114,7
Hydro, nuclear and imported electric energy (mill. kWh)	32.521,6	31.754,7	766,9	+4401,1	+4285,4	+115,7	115,7	115,6	117,8
Imported petroleum products (IPP) (th. Tones)	2.070,4	-	2.070,4	+536,1	-	+536,1	134,9	-	134,9
Thousand tones of oil equivalent (toe) (1000kcal/kg) (1 toe = 11630 kWh)									
Total resources	**34.090,3**	**2.3154,3**	**1.0936 ,0**	**-107,8**	**+0,7**	**-108,5**	**99,7**	**100,0**	**99,0**
of which:									
Net coal	6.536,1	5.969,3	566,8	-73,7	+23,4	-97,1	98,9	100,4	85,4
Crude oil	9.866,7	4.045,1	5.821,6	-1.222,6	-150,3	-1.072,3	89,0	96,4	84,4
Natural gas	10.393,1	8.559,1	1.834,0	+14,6	-219,8	+234,4	100,1	97,5	114,7
Hydro, nuclear and imported electric energy (mill. kWh)	4.646,8	4.580,8	66,0	+357,4	+347,4	+10,0	108,3	108,2	117,9
IPP th. Tones)	1.967,0	-	1.967,0	+509,3	-	+509,3	134,9	-	134,9

* th. Tones- thousand Tones

[11] National Institute of Statistics, Monthly Statistical Bulletin, 12/2010, Bucharest 2010, pg 54

In terms of electrical energy, the National Institute of Statistics[12] published the Balance for Electrical Energy for the year 2010 and as against to the previous year, which is described by table 4, presented below.

Table 4 Balance of Electrical Energy for the year 2010[13]

	1.I-31.XII.201	1.I-31.XII.2010 as against 1.I-31.XII.200	
	GWh	Differences (±) – GWh	/ in %
Resources Total	**60.533,1**	**+2.428,4**	**104,2**
Production	59.766,2	+2.312,7	104
- in classical thermo-power station	28.011,5	-1.972,7	93,4
- in hydropower station	20.131,2	+4.418,2	128,1
- in nuclear-electric station	11.623,5	-132,8	98,9
Import	766,9	+115,7	117,8
Destinations Total	**60.533,1**	**+2.428,4**	**104,2**
Final consumption	50.520	+1.847,5	103,8
- in economy	38.633,4	+1.698,4	104,6
- public lighting	690,6	-43,1	94,1
- population	11.196	+192,2	101,7
Technological own consumption in networks and power station	6.983,1	+497,2	107,7
Export	3.030	+83,7	102,8

As it can be seen from the table, the total amount of resources reached the value of 60.533 GWh having the following share: 1.3% imports, and 98,7% domestic production, of which 46,9% in thermal power stations, 33,7% in hydro-power stations and 19,4% in nuclear-electric power stations. The final destination for the energy resources were divided as follows: 11,5% for technological own consumption in networks and power

[12] National Institute of Statistics, Monthly Statistical Bulletin, 12/2010, Bucharest 2010, pg 54
[13] National Institute of Statistics, Monthly Statistical Bulletin, 12/2010, Bucharest 2010, pg 53

stations, 5,0% export, 1,2% public illumination, 63,8% consumption in economy and 18,5% population consumption.

For the period January- September 2010, the primary energy resources have dropped by 0, 4% while the electrical energy resources have increased by 2, 2% as compared to the same period of the previous year[14].

1.2. Introduction to the Romanian Wind Energy Situation

It is already a certainty of the global community that, in the context of climate change and global warming, fundamental alterations in the energy area should influence the 21st century in a substantial way.

The same strong guarantees are provided by experts and specialists concerning the increased demand of energy on a global scale in the next 20 years and on the fact that, despite that the reserves of fossil fuels are now considered to be larger than initially thought, they are, however, limited. This does not limit the important role fossil fuels will continue to play in the economy of the world, at least for the next 10 years.

But going beyond the limited character of the primary energy sources and focusing on the proven negative effects of the increased energy consumption resulting from primary sources of energy, severe measures were regarded as stringent. Debates are ongoing ever since the solution to this matter of concern was considered to be an energetic mix, consisting of fossil fuels, nuclear energy and renewable sources of energy that could cover the global demand.

Through the adoption of the United Nations Framework Conventions on Climate Change in 1992 and through the Kyoto Protocol from 1997, the first steps in this attempt were made. What followed afterwards, were legal limits for the GHG emissions for industrialized countries, including the EU-15 and on a longer term, bigger and bigger

[14] National Institute of Statistics, Monthly Statistical Bulletin presented in the OXYGEN- Energy for business magazine, a publication of the GDF Suez Romania, nr. 4(10), page 9.

commitments of the world's states to increase their share of RES in the overall energy mix.

The European Union regarded the energy policy as its main instrument in fighting climate change and introduced, in 2003, the Directive 2003/87/EC that defines the European Scheme of Emissions Trading for greenhouse gas in order to meet the desiderates of the Kyoto Protocol. Later on, amendments to this directive were made, in order to include also other emissions trading schemes and projects for the reduction of CO2, such as Joint Implementation and Clean Development Mechanism. Subsequently, in 2006 the European Union published a Green Paper on the "European Strategy for Sustainable, Competitive and Safe Energy"[15] and proposed a series of concrete actions for its member states, which included an action plan for energy efficiency, the development of domestic energy and natural gas markets, a roadmap for renewable energy resources, a treaty of the European Energy Community, a revision of policies regarding the mandatory reserves of oil and natural gases and a few more. Based on these proposals, in 2007 the Commission has published "A new European Energy Policy"[16] that presented the failure of the EU so far, proposed a strategic target and established a plan of action that would aim towards the new goal established. In March 2007 the European Council approved the document and it became the integrated strategy for energy and climate change of Europe. The main target was to reduce the GHG emissions by 20% until 2020 as compared to 2005 and the related objectives were to increase the percentage of RES in the total energy mix by 20%, to decrease the final energy consumption through the increase of energy efficiency by 20% and to increase the use of biofuels in transport by 10%, all having the deadline set for the year 2020.

Apart from the environmental benefits provided by the agreed policy, the EU saw this package of measures as an opportunity to reduce its imports of oil and natural gas by

[15] http://www.parliament.the-stationery-office.co.uk/pa/ld200506/ldselect/ldeucom/224/224.pdf
[16] http://ec.europa.eu/energy/energy_policy/doc/01_energy_policy_for_europe_en.pdf

2020 and thus, to save up to 50 billion Euro[17] and as a potential source of job creation (imports in Europe represent 54% of its energy; the annual imports are estimated at 350 Bill. Euros, in terms of energy prices for the year 2009, or about 700 Euro/year for each EU citizen).

It is very important to notice that Romania was the first country of the Annex 1 of the UNFCCC, that has ratified, through the legislation 3/2001, the Kyoto Protocol and that has took commitments in reducing the GHG emissions by 8% below the 1989 level within the period 2008-2012. Moreover, as a part of the European Union, Romania had to comply with the Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from RES and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC that set legally binding targets for each of the Member States (MS) of the EU. By setting clear targets for all MS of the EU, the overall 20% share of energy from RES in 2020 would be achieved in an efficient manner in regard to costs. This directive represented the kick off for the Romanian RES market and marked the beginning of what is often called as the Wind Energy Boom.

However, the reorganization of the electricity and heating sector of Romania had begun already in 1998 when the, at that time, RENEL (The National Electricity Company) was abolished through the Governmental Decision (GD) 364 and 365 from 1998[18] and new, separate companies were created and boosted the competition due to the divided structure of production, supply and transport. Moreover, the Romanian Energy Regulatory Authority (ANRE) was established as well as an independent transmission system, Transelectrica. Changes occurred also in the energetic legislation and the Electricity Law (Law 318/2003) created the legal framework for the newly separated activities, aiming at satisfying both the public and private interests The full opening of the electricity market took place in 2007, once with the accession to the EU, when the Law 13/2007 replaced

[17] The Communication of the Commission towards the Parliament and the European Council, 'An action plan for the security and solidarity in the energy area', Bruxelles, 13 November 2008, COM(2008)781 final.
[18] http://www.dsclex.ro/legislatie/2011/mai2011/mo2011_332.htm

the Electricity Law, assured the legal separation of supply from demand activities and transposed the provisions of the Directive 2003/54/EC into national legislation.

Romania has transposed the Directive 2001/77/EC provisions into its own legislation through GD no. 443/2003 with modification GD no. 958/2005 aiming on the long term to reduce the energy dependency of imported electricity by expanding its range of energy resources.

The national energy strategy of Romania for 2007-2020 has set very ambitious targets regarding **the share of RES in the gross national electricity consumption: 33% for 2010, 35% in 2015 and 38% in 2020**. However, according to the EU new Directive for promotion of RES in 2008 and draft Directive from 2009, the share of the energy produced from RES in gross national energy consumption for 2020 should be 24%.

Over the years, mostly due to the lack of a solid legislative framework, of the limits imposed by Transelectrica for the connection grid in regard to the transport capacities, as well as of a very uncertain basis of cadastres for land acquisition, haunting Romania back from the communist times, no major attention was paid to the wind potential of the country. Most of the RES exploited in the past were hydropower, biomass and in a smaller share nuclear power. Once with the limits of GHG emissions imposed by the EU, and with the binding targets set, Romania and together with it, numerous foreign investors started to channel their attention towards the southeastern part of Europe, and in particular towards Romania, what wind energy potential is concerned.

1.3. Wind potential in numbers

In their paper "Promoting Energy Efficiency and Renewable Energy: GEF Climate Change Projects and Impacts"[19], Martinot and McDoom have identified a considerable number of barriers that could counteract the application of energy efficiency measures

[19] Martinot and Mcdoom (2000), *Promoting Energy Efficiency and Renewable Energy: GEF Climate Change Projects and Impact,* Washington D.C. Global Environment Facility

and the transition towards an energetic policy based in a larger share on RES. Some of them are applicable and extremely relevant for the case of Romania and one in particular relates to the very beginning of wind energy promotion within the country. The lack of detailed information on the types of RES was regarded as highly important by the authors of the study; they have described how the managers, engineers, architects and, not lastly, even the consumers themselves, are affected by the lack of coherent data in regard to technical information, the distribution of RES on geographical regions, the experience in the field of production, etc.

This was also the case of Romania in regard to wind energy potential. Due to the fact that, for a long period of time the country based its production and consumption of energy considerably on the conventional sources of production, and merely on its own reserves, Romania confronted itself with the situation that no studies mapping the wind potential of the country were available. The investors could not even assess the business potential, as no clear data were on hand and the whole situation was regarded as rather uncertain, and for several years even left aside. Very late, only in October 2004 the first measurements for the wind potential of the region began. The first sites to be measured were the harbors Constanta and Midia and just in 2006 the studies were expanded more or less to the whole region, increasing also the height of the measurements form 40 to 150 m. Around the same period it has been developed a data basis, that now belongs to Eolica (joint company of NEK Umwelttechnik AG, Switzerland and Rokura S.R.L., Romania), that includes all technical data used for all types of wind energy projects: 3D models for the wind distribution of over 2500 km², cadastral maps for over 12000 hectares, etc. Based on the studies made[20] it has been established that the wind speed at over 100m reaches 6,8-7,5 m/s, providing the wind turbine with the optimal speed for functioning. In 2007, Mr. Attila Korodi, the Minister for Environment of that time, was proud to announce the first wind map for Romania that would ease the development of the wind potential of the country. Although wind studies have been made also in the past, and the research resulted into a wind map dating back to 1993, the official and complete map of the wind potential was only revealed in 2007, establishing the windy regions of

[20] http://www.cugetliber.ro/1221858000/articol/26401/comuna-mihai-viteazu-intra-pe-harta-energiei-eoliene/

the country. Based on this map (shown below: figure 1), several projects started to develop on the respective favourable zones.

According to the studies made, an average wind speed of 6.3m/s (at 60 meters above ground) is needed in order for a wind farm to be productive. Based on the map of the wind potential and taking into consideration also the land use of the respective zones, the South-East of Romania, in particular the Dobrogea and Moldova hills, as well as other hilly or mountainous plateau were regarded as highly efficient.

The map describes the wind resources of Romania, at a height of above 50 meters for different topographic conditions, ranging from high mountain area down to the flat areas (from the left to the right columns). The move and red areas are therefore the most advantageous, while the blue areas offer poorer conditions for wind farms constructions.

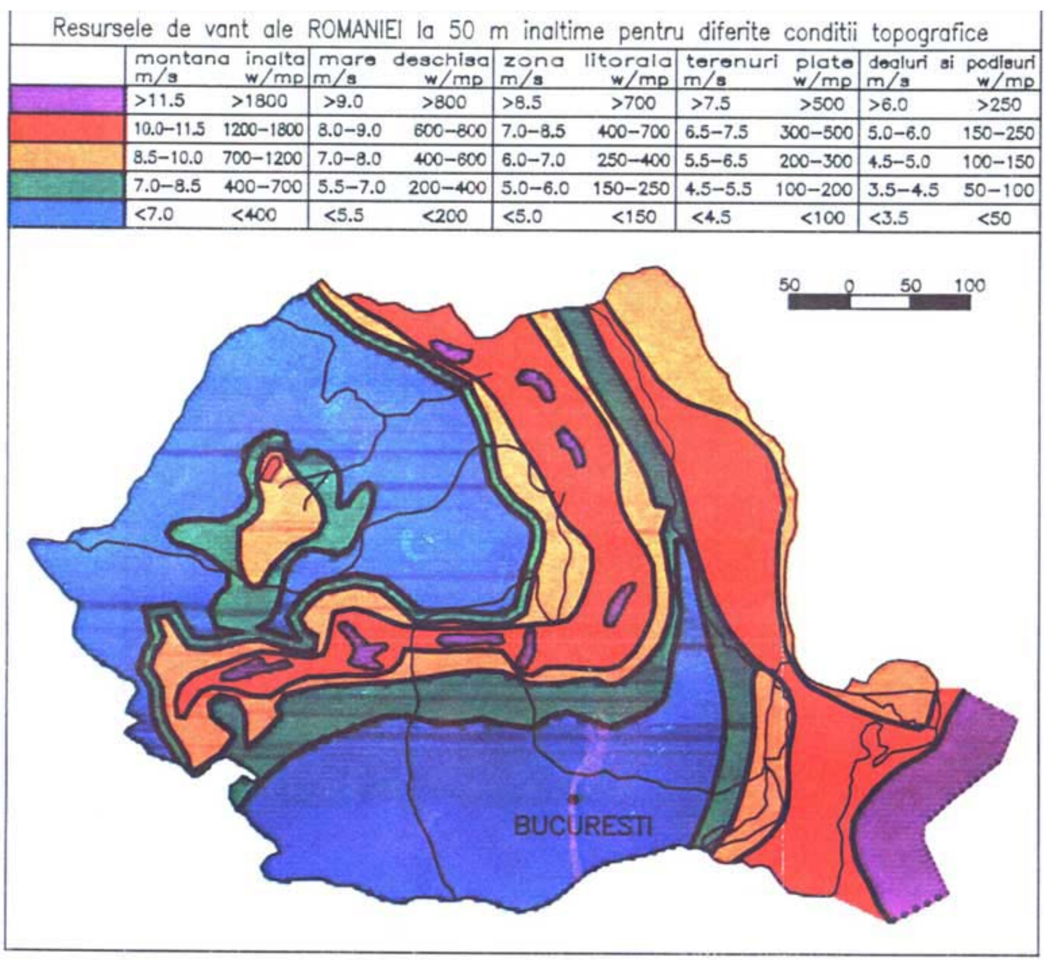

Figure 1 Wind potential of Romania

The wind potential of Romania is estimated at **14.000 MW installed capacity**, able of generating an impressive energy capacity of **23 TWh annually**, which makes Romania the second best place for wind farm construction in Europe, and entitles the country to compete with the offshore potential of other major European countries. Moreover, the Black Sea is regarded as a very attractive offshore possibility, which may become very competitive in the future, as long as the requirements of minimum 4 km distance from the shore and a water depth of at least 30 m are fulfilled.

In the past years, investigations have been made also in regard to the connection possibility to power lines of between 20 and 400 kV for the wind turbines with an installed power within the interval *0, 5-250* MW, that have a total capacity of more than 5000 MW in Dobrogea and more than 4000 MW in Moldova[21]. The studies have also mapped the best locations for the future wind farms to be constructed in the areas of Medgidia, Tulcea, Gura Ialomitei, Galati, Focsani, Munteni, Adjud, representing the E and NE of the Romanian territory.

Many investors have seen a business opportunity in the newly established Romanian market and have invested thoroughly in the country. Europe's largest onshore wind facility was commissioned in 2010 by the Czech Company CEZ, accounting for a total capacity of 600 installed MW.

The increased interest for the Romanian market draws back to the pre-accession period to the EU, when the Romanian government has established various strategies for the promotion of RES and RES potential, including the "Way forward in the energetic field in Romania"[22], approved through the Governmental Decision (HG) 890/2003. The document states clearly that in the future RES would be strongly encouraged and that RES would represent the way forward towards the development of the energetic sector in

[21] Neagu V., Parvu C. (2008).*'Aspecte privind racordarea centralelor eoliene la retelele electrice de interes public'*. ENERGETCA. Nr 11(Part 1), 483-486

[22] 'Foaia de parcurs din domeniul energetic din Romania' – Planul National de Actiune in Domeniul Energiei din Surse Regenerabile (PNAER) 2010 – Romanian national Action Plan in the Field of Renewable Energy Sources

the perspective of the year 2015. A very important role was played by the "Exploitation Strategy of the Renewable Energy Sources", approved by government through HG 1535/2003[23], which structurally presented the Romanian RES and their respective potential, as described in table 5.

Table 5 Energetic potential of the RES in Romania[13]

Renewable Energy Sources:	**Annual energetic potential**	**Application**
Solar Energy:		
- thermal	16.600GWh	Thermal Energy
- photovoltaic	1.200 GWh	Electric Energy
Wind Energy:	23.000 GWh	Electric Energy
Hydro Power	40.000 GWh	Electric Energy
- below 10 MW	6.000 GWh	Electric Energy
Biomass:	88.300 GWh	Thermal Energy
Geothermal Power:	1.950 GWh	Thermal Energy

As presented in the table, the total energetic potential of Romania from RES amounts to 177.000 GWh (177 TWh). The figure does not take into consideration the economic and network restrictions of the country. However, in order to comply with the directive 2009/28/EC of the EU, Romania has to manage a threshold of at least 50% utilization rate of the total potential, which would require solid investment in the green energetic sector of the country. After first studies, the government stated that this target could be achieved, even without outside help, although with increased efforts.

The same strategy[24] has established the following figures as quantitative objectives for energy produced from RES:

- for 2010: 19,65 TWh (electrical energy)
- for 2015: 23,37 TWh (electrical energy)

According to the above mentioned strategy, 30% out of the total electrical energy for 2010 should have initially been covered by energy coming from RES and 30, 4% for

[23] http://www.enero.ro/doc/MOF8-HG1535.pdf
[24] PNAER 2010 – page 10 (http://www.icemenerg.ro/PROSERV/PNAER.htm)

2015. These figures were later on modified, in an increasing manner, resulting in the actual shares of 33% for 2010, 35% for 2015 and 38% for 2020. A comparison between the targets set for 2010 and the actual achievements is at this stage not possible, due to lack of statistical data.

The share of wind energy in the total production of energy coming from RES, has increased in a fast pace over the last 3 years and will continue to grow even more. As already stated, it was the lack of technical data regarding the wind energy and its economic potential or the lack of a clear map of the wind resources of Romania that have hampered the development of the wind energy industry even before the starting point set, based on available data, for the year 2008. As can be seen in table 6, internal consumption of energy resulted from wind was not present in Romania before 2008.

Table 6 Gross domestic consumption of renewable energy[25] (expressed in GWh)

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Biomass & waste	32.133	24.830	27.340	33.075	36.448	37.041	37.041	39.076
Biogas								0,01
Geothermal Energy	0,081	0,058	0,19	0,20	0,15	0,20	0,20	0,23
Industrial Waste	1,11	2,61	1,30	1,03	1,04	0,98	0,94	1,23
Solar	0	0	0	0	0	0	0	0
Hydro	14.778	14.923	16.046	13.259	16.688	20.282	18.355	15.966
of which:								
-less than 1 MW	0	0	54	72	86	77	71	90
-between 1-10 MW	0	0	382	398	688	675	622	514
-more than 10 MW	14.778	14.923	15.610	12.789	15.914	19.530	17.662	15.362
Wind	0	0	0	0	0	0	1	3
Total	**46.912**	**39.755**	**43.387**	**46.335**	**53.137**	**57.324**	**55.397**	**55.043**

The last available data in regard to renewable energy are provided for the year 2008 and they show that there is an increase of wind resources used in the total mix of renewable

[25] Source: EUROSTAT

energy, however, still incomparable with the share of hydropower produced in the same year. Table differences are exemplified in table 7, shown below:

Table 7 Total production of energy from RES for 2008[26]

	in GWh	in %
Total hydro	**16.907**	**99,9%**
of which:		
- Hydro > 10 MW	16.1	95,4%
- 1 MW > Hydro < 10 MW	661	3.9%
- Hydro < 1 MW	102	0,6%
Wind	**11**	**0,1%**
Total production of energy from RES	**16.918**	**100%**

An increasing interest for the production of energy resulting from the wind potential of the country was noted also by the national transport and system operator of electrical energy of Romania. In the timeframe 2008- March 2010, Transelectrica has concluded three connection contracts for wind farms, with a total capacity of 600 MW and has given its consent for another 18 technical connection approval to the national transportation system for electrical energy for wind energy, having a total power of 2823 MW.

The situation of the number of connection contracts and respective technical connection approval it is synthesized in table 8.

[26] ANRE – Agentia Nationala de Reglementare in Domeniul Energiei- Romanian Energy Regulatory Authority in the Energy Sector

Table 8 Connection contracts and technical connection approval concluded for wind farms in the timeframe 2008- March 2010[27]

Network Operator	**Connection contracts**		**Technical connection approval**	
	Producers	**Installed Capacity (MW)**	**Producers**	**Installed Capacity (MW)**
TRANSELECTRICA	3	600	18	2.823
ENEL Dobrogea	58	1.539	19	522
FDEE Electrica Distributie Muntenia Nord	30	376,03	14	430,9
E.ON Moldova	7	16,69	8	300,6
Enel Banat	3	89	2	160
CEZ	1	1,8		
Total	**102**	**2.622,08**	**61**	**4.236,5**

The extended number of connection studies is important to be analyzed also from a point of view of the geographical area it involves: despite the increased number of connection studies endorsed, for example, for the period 2009-2020, amounting to some 12000 MW installed power, which exceed the current maximum consumption, the development it is characterized by an agglomeration of studies approved, 60% of which deal with the wind power plants in the Dobrogea region, 30% of them in the Moldova region and 10% across the country. This factor has consequences on the National Transport Service (NTS), as an occurrence of the new sources of renewable power, clustered within a zone (Dobrogea and Moldova) that demand a relatively low energetic consumption, and that are situated far away from other consumption centers, leads to considerable power circulation along the transmission lines and to strong influences in the voltage level, while the active power loss increases.

Based on the endorsed technical connection approvals and contracts, the Romanian Wind Energy Association (RWEA) made a study regarding the near future of the wind energy situation in Romania and the potential number of MW that can be installed every year until 2013. The table below shows the wind energy forecast until 2013, grouped by

[27] Transelectrica, official website

investors with their specific locations set for the projects and the respective number of expected MW to be installed each year. As can be seen in the last line of the table, the total amount of installed MW is forecasted to grow each year, ranging from 14 installed MW in 2009 up to 1508 in 2013, depending on the legislative framework and on the general development of the country.

Table 9 Romania wind energy forecast until 2013[28]

Company	Location	MW to be installed per year				
		2009	2010	2011	2012	2013
Miscellaneous companies	Different localities-already running	14,1	5			
Holrom	Baia		5			
	Harsova			40		
	Tataru			8		
	Deleni			8		
	Fagarasu			8		
	Dulcesti			5		
Blue Planet	Baia					10
Global Wind Power	2 wind farms in Galati			14		
	5 wind f. in Galati and Dobrogea			28		
Renovatio/ EDPR	Pestera		90			
	Cernavoda			138		
	Constanta county				26	
	Vutcani			24		
	Sarichioi			33		
	Galati county					100
	Galati county				30	
	Albesti			28		
Monsson	Silistea 2		5			
	Galbiori		5			

[28] http://rwea.ro/statistici

Company	Location	MW to be installed per year				
		2009	2010	2011	2012	2013
CEZ	Mireasa 2		10			
	Dobrogea area					200
	Silistea 1			25		
	Fantanele		300	47,5		
	Cogealac			50	202,5	
Bogaris	Harsova				72	
	Facaieni					52
	Victoria					40
IMA PARTNERS+ Verbund	Casimcea, Topolog, Daieni				100	432
Land Power	Topolog				168	
IMA Partners+Partners	7 localities from Vaslui North and Iasi South counties				132	510,5
Martifer	Babadag			42		
	Casimcea				40	
ENEL	Tulcea county		34	140	118	
	Constanta county					
EP Global Energy	Chirnogeni-Independenta				80	
PNE WIND	Moldova+Dobrogea areas				200	
Petrom	Dobrogea area			45		
Electricom	Dobrogea area			20		
IWE	Mitoc (Botosani county)					100
Iberdrola	Mihai Viteazu				80	
Alstom	Borsa (Bihor county)				56	
Karomex	Dobrogea area				30	63
TOTAL		**14,1**	**454**	**704**	**1.335**	**1.508**
Grand TOTAL		**4.013,6**				

The accuracy level of the figures presented in the table is over 90% for 2010 and 2011; for 2012 and 2013 there is also a high degree of accuracy, nevertheless, the development will depend on the evolution of the law 220 and on Romania's general economical development.

Concerning the future of electrical energy produced within the wind farms and in particular the evolution of the electric power in the perspective 2014-2019, the Romanian Institute for Studies and Energetic Projections (ISPE) has published a report[29] regarding the installed and produced power in the wind power plants, taking into account three different hypotheses. This report, as we will see in a later chapter, had a strong influence on the decisions met in regard to the development and consolidation of the national power grid. The three different hypotheses function as described below:

- the **first hypothesis** (hypothesis I) relates to the wind power plants that already have a connection contract;
- the **second hypothesis** (hypothesis II) includes the wind power plants which have a technical connection approval and those having a contract and
- the **third hypothesis** (hypothesis III) covers the wind power plants having a connection solution study completed and approved by the network operator but that do not meet (yet) the legal conditions for obtaining the technical connection approval.

The installed power for the period 2014-2019 is expected to reach a value ranging from 2235 to 14200 MW, including all stages of the process of connection to the network. The situation presented in the table below has been updated at the end of the winter 2010 and presents the installed power and the produces power forecasted for the period 2014- 2019 based on all the above mentioned hypotheses.

[29] Necessity and Opportunity of building a new 400 kV OHTL between Gadalin and Suceva in the context of the European Union requirements regarding the environment, security of supply and electricity market; ISPE Bulletin, VOL 53.- nr. 4/ 2010, Bucharest, 2010

Table 10 The installed power and the produced power in the Wind power plants[30] (expressed in MW)

Connection area		Analysis stage 2014						Analysis 2019			
		Hypothesis I		Hypothesis II		Hypothesis III		Hypothesis I		Hypothesis II	
		Power installed	Power produced	Power installed	Power installed	Power installed	Power installed	Power installed	Power produced	Power installed	Power installed
RET	Dobrogea	600,0	420,0	1.472,0	1.030,4	5.226,0	3.658,0	1.472,0	1.030,4	6.311,0	4.417,7
	Moldova	0,0	0,0	826,5	248,0	2.740,0	822,0	826,5	248,0	2.740,0	822
	Banat	0,0	0,0	150,0	45,0	150,0	180,0	150,0	45,0	150,0	180,0
Dobrogea 110 kV	Constanta	565,4	395,8	1.543,5	1.080,0	1.722,7	1.205,9	1.543,5	1.080,0	1.722,7	1.205,9
	Tulcea	576,2	403,4	715,6	500,9	763,6	534,5	715,6	500,9	763,6	534,5
	Gura Ialomitei	0,0	0,0	0,0	0,0	136,0	95,2	0,0	0,0	136,0	95,2
	Galati	161,5	113,1	161,5	113,1	311,5	218,5	161,5	113,1	311,5	218,1
	Lacu Sarat	72,0	50,4	210,0	147,0	257,5	180,3	210,0	147,0	257,5	180,3
Moldova 110 kV		17,6	5,3	612,6	183,8	971,1	291,3	612,6	183,8	971,1	291,3
Muntenia 110 kV		153,8	46,1	353,8	106,1	583,3	175,0	353,8	106,1	583,3	175,0
Banat 110 kV		90,8	27,2	250,8	75,2	250,8	75,2	250,8	75,2	250,8	75,2
Rest NPS 110 kV		0,0	0,0	4,5	1,4	4,5	1,4	4,5	1.4	4,5	1,4
TOTAL		**2.237,4**	**1.461,3**	**6.300,8**	**3.531,4**	**13.117,5**	**7.437,4**	**6.300,8**	**3.531,4**	**1.4202**	**8.196,5**

One of the biggest disadvantages of the wind turbines is confirmed by the great number of studies that have been made in the area, as well as by the activities and situations presented by different producers/distribution operators: a 100% production of the installed power of the wind turbines can never be achieved. That is why the power grid system has to be able to compensate for the periods when the wind turbines do not satisfy the demand, with energy produced by other energy sources or through international exchanges. The difficulty is to achieve a perfect balance of energy flow, according to the very unstable character of energy generated by the wind turbines in the exact moment the demand is present, without producing any insufficiencies for the consumers or without

[30] Necessity and Opportunity of building a new 400 kV OHTL between Gadalin and Suceva in the context of the European Union requirements regarding the environment, security of supply and electricity market; ISPE Bulletin, VOL 53.- nr. 4/ 2010, Bucharest, 2010, pg 35

violating the international contracts. That requires a tertiary reserve that has to immediately compensate for the differences between the forecasted production and the real production. Studies have been made also regarding the volume of the tertiary reserve; for example in Germany an 8-9% tertiary reserve would suffice, for Finland 4-7%, etc[31]. Studies published by the Union for the Co-ordination of Transmission of Electricity (UCTE) show that the guaranteed power production represent, on average, 25% of the installed power (10% in Germany, 50% in Luxembourg, 35% in Holland, 30% Portugal and 25% in Spain).[32]

[31] Energetica, nr. 11, Noiembrie 2008, Integrarea centralelor eoliene si calitatea energiei electrice in Sistemul Energetic National din Romania, Institutul National pentru Studiul Amenajarii si Folosirii Surselor de Energie, Bucuresti, 2008, pg 440

[32] Energetica, nr. 11, Noiembrie 2008, Integrarea centralelor eoliene si calitatea energiei electrice in Sistemul Energetic National din Romania, Institutul National pentru Studiul Amenajarii si Folosirii Surselor de Energie, Bucuresti, 2008, pg 441

2. Environmental Aspects of Wind Power

The judicial system of a state and the legislation in force govern, in a cross-dimensional manner, the activities and developments taking place on the territory of that particular state, including, thus, the changes on the energetic market.

Discussing the Romanian legislative framework, in particular what the Environmental Impact Assessment (EIA) is concerned, on the background of the adopted European law, plays an important role, as we will see that the construction of wind farms may, without question, be influenced by the results of an EIA, in particular when considering the consultations with the public as the key feature of environmental assessments.

2.1. Introduction to the EU Environmental Impact Assessment Directive

The Council Directive of 27 June 1985 (85/337/EEC)[33] on the assessment of the effects of certain public and private projects on the environment represents the milestone of any EIA and sets the legal framework for this procedure.

As laid down in Art. 1(1), the Directive "shall apply to the assessment of the environmental effect of those **public and private projects** which are likely to have significant effects on the environment"[34]. The role of this procedure is to ensure that the environmental implications of decisions are well considered before the decisions are actually made. The terminology used in the framework of the directive is set by article 1 (2), which describes exactly how specific terms, such as 'project', 'developer', 'public', etc. should be understood.

The exact definition of the Environmental Impact Assessment is provided by Article 3. According to this article , "the environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case and in

[33] http://ec.europa.eu/environment/eia/full-legal-text/85337.htm
[34] Directive 85/337/EEC on Environmental Impact Assessment

accordance with Articles 4 and 11, the direct and indirect effects of a project on the following factors:

- human beings, fauna and flora
- soil, water, air, climate and landscape
- material assets and the cultural heritage
- the interaction between the factors mentioned in the first, second and third intends"[35].

The Directive is completed by four Annexes, the firs two being of particular importance for the nature of the project subject to an EIA, by explaining the difference between various types of projects that **must/might** be subject to an EIA. According to article 4(1), the "projects listed in Annex I shall be made subject to an assessment in accordance with Articles 5 to 10", therefore requiring a mandatory EIA, while the second paragraph, referring to the projects listed in Annex II, gives the possibility to the EU Member States, through a so called 'screening procedure ', to decide whether the project shall be made subject to an EIA, in accordance with Articles 5 to 10, by choosing between "(a) case-by- case examination or (b) threshold or criteria set by Member State" or to even apply them both. In either case (a) or (b), the selection criteria set out in Annex III of the Directive must be taken into account. Article 4 provides also for public access to information in the case of determination made by the competent authorities under paragraph 2.

The EIA Directive was amended three times since its publication; the first time in 1997 (97/11/EC), when the scope of the initial EIA Directive was widened by increasing the types of projects covered by Annex I, provided for new screening arrangements and new screening criteria and brought the 85/337/EEC Directive in line with the UN ECE Espoo Convention; in the second amendment of 2003, (Directive 2003/35/EC), the scope was to align the amended Directive with the Aarhus Convention in regard to the provisions on public participation in decision- making; the third time, in 2009, (Directive 2009/31/EC), it amended the Annex I and II of the Directive, adding some new projects

[35] Directive 85/337/EEC on Environmental Impact Assessment

related to the transport, capture and storage of the carbon dioxide[36]. In the last years the EIA legislation has moved away from being solely a defensive tool used in the attempt to protect the environment and has gain some more importance, developing into a tool that actively contributes to the environmental sustainability with several feedback loops to and from the Strategic Environmental Assessment (SEA – evaluates the environmental implications of policies, plans and programmes at a higher level of the decision-making process).

2.1.1. Particularities of the Environmental Impact Assessment Procedures

The EIA Regulations include certain requirements to the manner in which an Environmental Impact Assessment shall be conducted. However, despite the binding nature of the EU legislation for the Member States (MS), differences appear in the transposition of the European law into national law. Reasons for that are various, including the adherence of new MS that require a certain period of time to adapt and pass their legislation in order to comply with the EIA, the lack of clarity of the methods used for implementing the Directive, as a result of combining different types of legal instruments without specifying the relationship between them, as well as the desire of some MS to go beyond that what was required by the Directive (e.g. the Austrian EIA Act contains provisions for scoping, Environmental Impact Expertise, apart from the Environmental Impact Statement, public participation in several stages of the EIA and post-project analysis). On top of that, the comparison of different methodologies and procedures related to the EIA legislation may be burdened also by the translation of the terminology, as the mere understandings of a legal term or the name of the institutions can make the difference in assessing correct the variations.

An attempt to compare the procedures used for completing an EIA for various types of projects, on the one hand for EIA conducted within the European Union, and on the other

[36] European Commission- Environment / http://ec.europa.eu/environment/eia/eia-legalcontext.htm

hand for EIAs conducted in one of the newest MS of the EU, Romania, is provided in the following.

2.2. Environmental Impact Assessment Procedure in EU

There are several important steps that need to be covered in order to complete an EIA in accordance with the EIA Directive. Due to the fact that the EIA is a tool that is under a continuous development within the institutional structures of the MS, and taking into account the fact that the decisions of the MS in regard to environmental issues may reflect, in a larger or smaller share, the prevailing environmental policies of the respective MSs, the European procedure presented below has an informative nature of how an EIA should be conducted and of the major steps involved, and does not reflect the particularities of different MS of the EU.

It is important to bear in mind that the EIA is a cyclical project with feed-back loops between different stages of the project, as well as between the actors involved in the decision-making process. After the amendment from 2003, when the public participation gain even more importance, the feed-back loops and their problem free functioning has became crucial, as they can influence the final result of the EIA.

The project starts with the preparations which are made by the developer or the owner, mainly by developing a proposal for the project. In some MS, however not as a general rule, the competent authorities shall be in advance informed by the developer of the application for development consent. Notifying the competent authorities may have an informal character and it can be done on a voluntary basis.

The preparation of the project is followed by the first major step in the EIA procedure, called the **screening** of the project. The requirements of the screening procedure are to be distinguished based on Art. 4 (1) and (2) of the EIA Directive, in respective of the Annex

I and Annex II projects, as presented above, in the chapter “Introduction to the European Environmental Impact Assessment”. The screening represents the part that assesses whether a formal EIA is required for that particular project. It is the duty of the competent authorities to evaluate whether the project requires a formal EIA, in particular for project being regarded as belonging to Annex II of the EIA Directive. The developer may decide to undertake a formal EIA, without going through the screening stage, however this option has just a voluntary nature. The result of the screening should be recorded and made public.

The second step is the **scoping** of the project. Is establishes a more detailed cover of the EIA process and lays down which exact impacts and issues shall be considered, inspecting also whether all the relevant information for the project are included in the impact evaluation. As well as the screening, scoping involves two major actors, the developer and the competent authorities, but introduces also the potential other players that might take part in the EIA, such as the local authorities and statutory agencies or the communities. The scoping stage is as detailed as possible, to the extent that potential direct, indirect or cumulative impacts can be included and contains information about the purpose of the project, as well as insights of the characteristics of the project, such as for example the location of the project or the processes involved. An important characteristic of the scoping procedure is that it must include the state of the environment at the moment the project is submitted and forecasts regarding the future development of the environment that might come in connection to the implementation of the project. In general, the forecasts should be made for a time period equal to the lifetime of the project. The mitigation measures presented in the scoping procedure are to be completed with monitoring implications. Although most of the times rejected by the developer based on economic or technical grounds, the evaluation of alternatives, be it technical or technological is a component of the scoping stage that can provide rapid cost-efficient solutions in case of unforeseen problems during the development of the project.
As provided in the EIA Directive the developers may require a scoping opinion to the competent authorities, that when responding to the request, according to Art 5 (2), may consult both the developer itself and the authorities listed in Art. 6 (the “authorities likely

to be concerned by the project"[37]). Therefore, apart for the MS where the Scoping procedure is mandatory, this stage of the EIA process has a voluntary nature.

The third stage of the process, **impact analysis and mitigation**, develops in a strong relation with the scoping process, as the issues discovered in the scoping are here analyzed in more detail and the impacts are thoroughly defined. In the frame of this step, the developer usually prepares the environmental information which is required by Article 5 of the Directive. By predicting the impacts, the aim is to examine the magnitude of the changes that might appear in the environment, be it due to implementation of the project or not, and to shad light on those projects that are necessarily to be taken into consideration. The list below presents the projects that require special attention during the prediction of impacts[38]:

- Physical and socio-economic
- Direct, indirect and cumulative
- Short and long run local and strategic
- Adverse and beneficial reversible and irreversible
- Quantitative and qualitative
- Distribution by group and/or area
- Actual and perceived relative to other developments

The assessment of impacts has the role to determine the order in which specific impacts could be avoided, mitigated or compensated. The mitigation part of the process comprises the measures of avoiding, reducing and if possible remedying the impact the particular project may pose on the environment, without being limited to one point of assessment.

Prior to the decision-making, the forth step, **production and review of the EIS**, refers to the submission by the developer of the gathered documentation obtained in the undertaken assessment to the competent authorities, together with the application for the development consent. In some MS the information is verified to see whether it is

[37] EIA Directive 85/337/EEC

[38] http://ec.europa.eu/regional_policy/sources/docgener/evaluation/evalsed/sourcebooks/method_techniques/boxes/types_of_impacts_considered_during_prediction_of_impacts_en.htm

adequate through a formal requirement for independent review. There are also MS that entitles the competent authorities to determine if the information provided is adequate or not. In case the information provided is considered to be inadequate, the developer may be asked to provide some additional information. There are also provisions regarding the right to appeal against the solicitation for further information. The environmental information takes the form of an Environmental Impact Statement (EIS), which is made available to the environmental authorities and to the public, which can in return make comments upon the presented documentation. All the interested organizations, as well as the general public, must be given the opportunity to comment on the project and its implications on the environment, based on the provided information, before any decision regarding the approval of the application is taken.

The review relates to the feedback provided in regard to the quality of the EIS, and is, in some MS, a formal requirement for an independent review, which needs to be conducted before the whole documentation is deposited to the competent authorities.

The next step is the **decision-making process**, where the competent authorities play the most important role, as the decision lays in their hands, upon considering all the documents provided by/ on behalf of the developer of the project. The information taken into account must include also the EIS and the findings of the consultations. The announcement of the decision must be made public and the reasons for the respective decision together with a short description of the actions that will be taken to mitigate the impacts on the environment should be clearly stated.

The EIA procedure has not, however, finished with the decision-making step; after the decision was taken, there are two types of monitoring that make the object of the sixth step, **post-decision monitoring and audit**. The baseline monitoring is the one that takes place before the implementation of the project, while the impact monitoring relates to the monitoring that continues even after the project was implemented. Post-auditing a project has the role to compare the impacts predicted in the EIS with the impacts actually exerted on the environment and gives more or less a feedback regarding the EIA. It also contributes to the improvement process of future EIAs.

The above presented steps of an EIA provide for a brief overview of the procedure and are synthesized in picture 1. The European law provides, of course, specific clarifications on the role of all the actors involved in the process as well as on the exact directions to be followed within each stage of the project. The European Commission has issued sets of guidance in regard to the three major steps in the EIA procedure: Screening, Scoping and EIS Review, in order to help those involved reach the best decisions in regard to an EIA, by drawing upon the international and European experience in the implementation of an EIA. An attempt to provide even more detailed information is presented below, in the hope that the differences between the Romanian and the European EIA procedure will become even more visible.

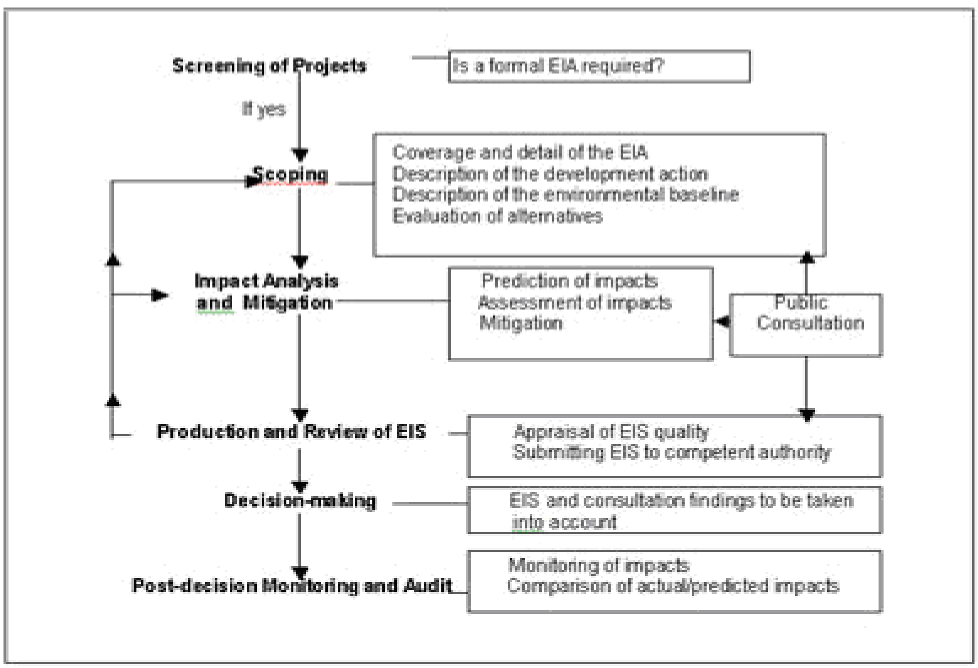

Figure 2 Main steps in the EIA procedure[39]

[39] Source : http://ec.europa.eu/regional_policy/sources/docgener/evaluation/evalsed/sourcebooks/method_techniques/boxes/main_steps_in_eai_process_en.htm

The guidance on EIA- screening stage was prepared by the Environmental Resource Management and released by the European Commission in June 2001.

The requirements for the screening stage are provided in Article 4 of the 97/11/EC Directive, giving the freedom to the Member States to choose the way the Directive shall be interpreted, in particular in regard to Annex II projects, for which an EIA is not mandatory. While some of the countries have set higher criteria than actually required by the Directive, and introduced some of the Annex II projects on the mandatory list, other MS of the EU simplified the procedure and introduced some "exclusion" lists that specify for which types of projects an EIA is not required, thus making the whole process less bureaucratic.

Differences between the MS appear also in the initiation of the screening process and relate mostly to the notification for project application, that in some countries it is required to be submitted to the competent authorities. The competent authorities should then advise the developer and the public if an EIA is required, based on the explicit formal screening decision taken by the authorities. However, not all MS have such strict rules of the application notification, but rather it may be done on a voluntary basis. For these particular MS there are provisions that allow for the EIA request to be submitted even before the application is sent.

The scheme below presents in a detailed manner the sub-stages that take place within the screening procedure, proposing always the next steps for both yes/no answers to the questions that make the subject of the screening procedure. It should be, however, not forgotten that the MS may have different approaches and expectations towards these requirements, and the procedure may, therefore, vary in the EU countries. The result of the screening procedure is presented in the last step (Step 5), with its guidelines.

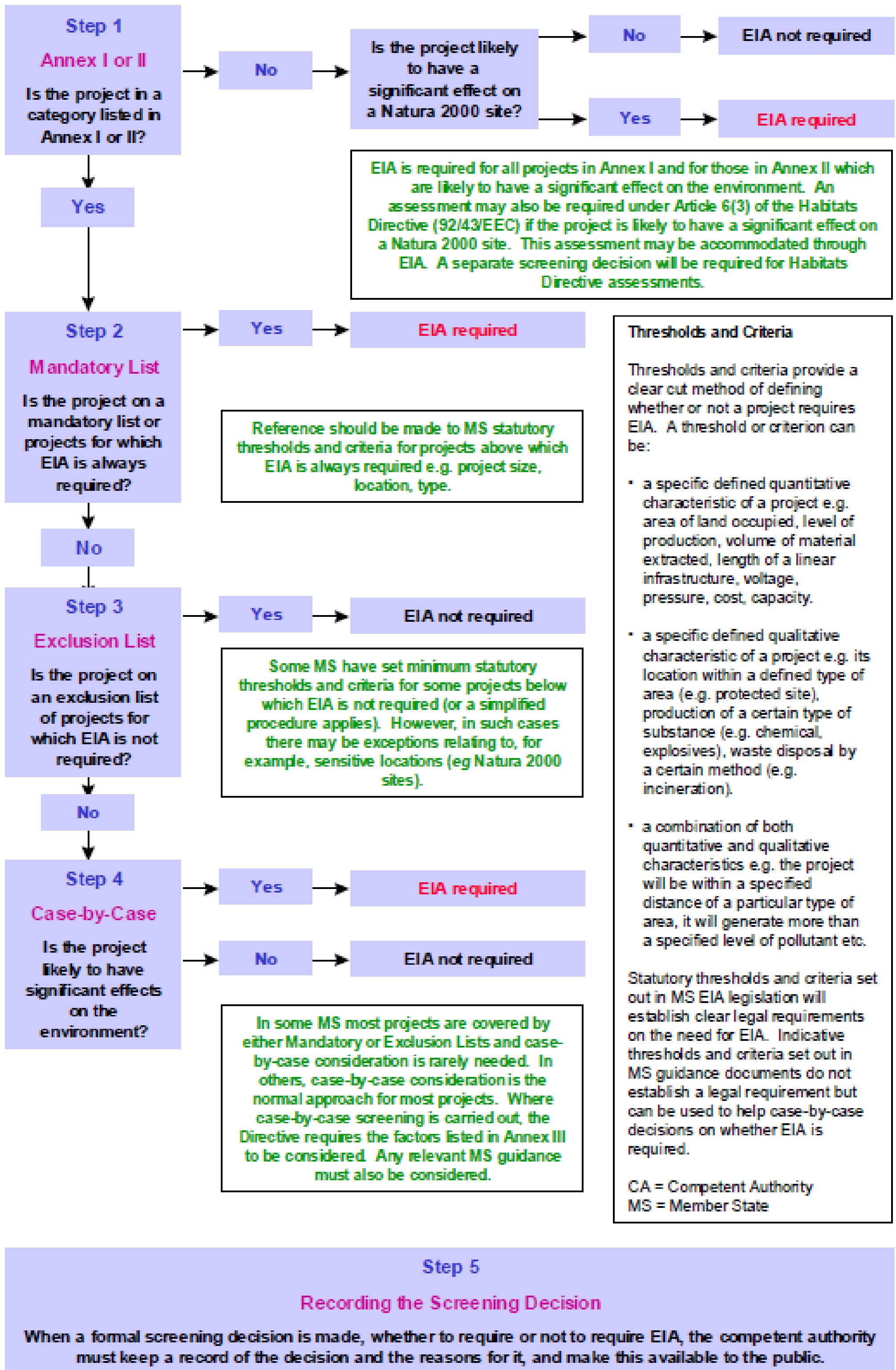

Figure 3 Steps in screening[40]

[40] Guidance to EIA- Screening; European Comission, June 2001

The scoping procedure is governed by Article 5(2) of the Directive 97/11/EC which requires that "Member States shall take the necessary measures to ensure that, if the developer so requests before submitting an application for development consent, the competent authority shall give an opinion on the information to be supplied by the developer in accordance with paragraph 1 [Article 5(1)]. The competent authority shall consult the developer and authorities referred to in Article 6(1) before it gives its opinion. The fact that the authority has given an opinion under this paragraph shall not preclude it from subsequently requiring the developer to submit further information."
The formulation provides for sufficient freedom of interpretation regarding to what 'the necessary measures' would be, therefore, differences in the national legislation arise. The implementation of the scoping procedure across the EU differs so widely that it led to the creation of two different systems of implementation. One system provides that the scoping procedure is undertaken by the developer itself, with a draft scoping report being circulated among the actors participating in the EIA, while the second system emphasizes the authority of the competent officials that undertake the scoping procedure and that emit a scoping opinion. Within the second system the scoping could be performed either by the competent authorities or by a specialized body, such as the EIA Commission.

Variations among the MS can be found also in what the content of the Scoping Reports and Opinions is concerned. Since some of the MS are just implementing the procedure, the practice is not a fixed system, but rather one that is subject to improvements. Although a general understanding of the scoping documents' scoping makes reference to content and extent of information to be provided by the developer to the competent authority as reference points to be included in the documents, some MS extended the area to be covered by the Scoping reports and Opinions, including:

- alternatives which should be considered;
- baseline surveys and investigations which should be carried out;
- methods and criteria to be used for prediction and evaluation of effects;
- mitigation measures which should be considered;
- organizations to be consulted during the environmental studies;
- the structure, content and length of the environmental information (or EIS).

Although included in all scoping systems developed by the MS, the extent of the measure of consultations differs among the countries of the EU. The more developed systems extended the parties involved in the consultations up to the level of the general public, while other systems committed strictly to Article 6(1) of the Directive 97/11/EC, allowing for consultations only with the relevant environmental authorities.

There have been developed various methods that might help in the scoping process, however most of the EU member states use common tools, such as scoping checklists and matrices. Some of the common checklists are the Scoping Checklist that provides information on the details of the project that might pose a threat to the environment, a Checklist of Criteria for Evaluating the Significance of Environmental Effects, similar to the screening list and a Checklist on Alternatives and Mitigation Measures.

The environmental information takes the form of an Environmental Impact Statement and as presented in Annex IV of the Directive 97/11/EC and Article 5 (3) of the same EIA Directive it must comprise at least the following documentation:

- a description of the project with the exact details on the location, design and size
- measures aiming at reducing, mitigating or even remedying the significant environmental impacts
- all the data used to assess and to identify the extent to which the environment is affected by the environment
- the alternative provided by the developer, including his justification for that particular alternative
- a non-technical summary of the information attached.

The above list is, however, not exhausted, the Annex IV provides for more information that may be an integrant part of an EIA project.

As well as for the scoping stage, also for the EIS Review have been developed a series of tools that help in the implementation of the requirements. The EIS Review Checklist acts as a self-control mechanism that verifies the compliance with art. 5 and Annex IV of the

Directive and contains questions related to the description of the project, consideration of alternatives, description of the environment likely to be affected by the project, description of the likely significant effects of the project, description of mitigation, non technical summary and the quality of presentation[41]. The two main goals of the checklist are to assess whether the decision-makers have received all the necessary documentation for meeting a decision and to decide whether the communication with the consulters and the general public had a consistent manner, allowing them to provide added value to the project.

2.3. Environmental Impact Assessment Procedure in Romania

Once with the accession to the European Union, Romania had to adapt and to implement the European legislation into national legislation; that was also the case for the legislative framework of the EIA.

The implementation of the EIA Directive was completed on April, 8th 2009 when it was transposed into national legislation though a Governmental Decision, 445/2009 (Decision 445/2009 regarding the evaluation of impacts for certain private and public projects on the environment) and published in the Romanian Official Journal three months later, under the number 481/13.VII.2009.

The Methodology of the EIA was approved in Romania in February 2010, through the Order 135/2010 (from now on referred to as The Methodology), by the Ministers of Environment and Forests, Administration and Interior, Agriculture and Rural Development and Regional Development and Tourism and published in the national Official Journal under the reference 274/27.IV.2010. Upon its entering into force, the

[41] European Commission, Guidance EIA – EIS Review, June 2001

previous order (860/2002) regarding the approval of the EIA procedure and the release of the environmental contract was revoked.

As we saw in the Chapter ‘Environmental Impact Assessment Procedure in EU’, the Annexes I and II play a very important role in the EIA legislation, as the requirement of an EIA depends on the Annex where the project was included. The differences between the EU member states in regard to the content of the two Annexes was already discussed in the previous chapter; it is, however, important to see whether Romania has brought any changes to the two Annexes of the Council Directive 85/337/EC or it has transposed it into the national legislation as a whole. After comparing the two legislations, the Romanian system seems to have transposed the Directive in its entirety, up to the 2009 amendment; the reason behind that is, probably, caused by the fact that the last amendment of the EEC Council Directive entered into force after the transposition of the European legislation into national legislation, which took place in the same year.

In Romania, the specific terminology of an EIA (environmental agreement, development approval, project, public, concerned public, report on the environmental impact, developer) is defined by Article 2 of the Governmental Decision 445/2009 which also applies for the methodology described by the Order 135/2010. Therefore the premises of a common understanding of the most important terms and expressions are met. It is, however, important, to define a judicial term that appears in the Romanian EIA legislation and that refers to the assessment required for any type of project that might have an impact on the natural area of community interest, as established by art. 28 of the Emergency Ordinance nr 57/1007, in regard to the regime of the protected areas, the conservation of the natural habitats, wildlife, including the respective amendments.

The Romanian EIA methodology is preceded, as stated in Art. 6(2) of the Decision 455/2009, by an initial evaluation of the project undertaken by the public authorities for the protection of the environment regarding the localization of the project in relation to natural protected areas of community interest. The same initial evaluation is maintained also in the EIA Methodology, as referred to in art. 4.

The EIA procedure is conducted, as foreseen in art. 2 of the Methodology, by the competent authorities for the protection of the environment, in conformity with art. 8 (1) of the Emergency Ordinance of the Romanian Government regarding the protection of the environment, 195/2005.

In the Romanian legislation, the EIA represents the framework of an integrated approach, in the way that it informs and consults all the authorities that bear environmental responsibilities. In this regard, according to art. 2(2) of the adopted EIA Methodology, a **Commission for the Technical Analysis (CTA)** is established in the respective county where the project takes place and is formed, according to art. 2 (3), of representatives of all the authorities involved in activities related to the protection of the environment, clearly indicated in the article. Whenever the project is under the jurisdiction of the central public authority for the protection of the environment, the CTA becomes a central institution.

The afferent taxes for the framework procedure are established through the Minister's Order 1.108/207 regarding the amount and type of taxes charged by the national authorities for the services done in the field of environmental protection.

Under the adopted Romanian EIA Methodology, the county agencies for the protection of the environment are in charge for the fulfillment of all EIA stages and they are also the ones emitting the environmental protection agreement. Within the projects that are assessed as being subject to an EIA, the Methodology differentiates between **six types of projects and the competent authorities** that are governing them. In this respect:

- **The county agencies for the protection of the environment** are responsible for the fulfillment of all EIA, the steps of the adequate assessment, and for granting the environmental agreement for **projects subject to the Methodology and taking place within the county's boundaries**.
- **The regional agencies for the protection of the environment** are responsible for fulfillment of all EIA steps, the steps of the adequate assessment, and for

granting the environmental agreement for **projects under the incidence of the legislation regarding the pollution prevention and control** within the development area **and projects of which area exceed over two or more counties** in the same developmental area.

- **The National Environmental Protection Agency** is responsible for the fulfillment of all EIA steps, the steps of the adequate assessment, and for granting the environmental agreement for **projects subject to the EIA Methodology and that cover two or several developmental areas**.
- **The Danube Delta Biosphere Reserve Administration** is responsible for the fulfillment of all EIA steps, the steps of the adequate assessment, and for granting the environmental agreement for **projects developing within the Biosphere Reserve 'Danube Delta'**.
- **The Regional Environmental Protection** is responsible for the fulfillment of all EIA steps, the steps of the adequate assessment, and for granting the environmental agreement for **projects developing within the borders of one county, outside and inside the Biosphere Reserve 'Danube Delta' area**.
- **The Central Public Authority** for the protection of the environment is responsible for the fulfillment of all EIA steps, the steps of the adequate assessment, and for granting the environmental agreement for **projects listed in art. 19 of the Emergency Ordinance 195/2005** and the annotations made through the Legislation 265/2006.
- **The Central Public Authority** for the protection of the environment is responsible for the fulfillment of all EIA steps, the steps of the adequate assessment, and for granting the environmental agreement for **projects with a significant transboundary impact.**

Under the Romanian legislation, the EIA procedure starts with an initial screening of the project for which the developer of the project has to make a request for an environmental protection agreement to the county's authorities by submitting a notification in regard to its intentions to develop the project, accompanied by an urbanism certificate as according with the legislation in force, the annexes and the proof of paid taxes for this part of the procedure. The response of the authorities, that has to come not longer than **ten days** after it has been received, establishes, as according to art. 9 (1), whether:

a) the project does not require an EIA or an adequate assessment (for project that do not fall under the incidence of the art. 28 of the Emergency Ordinance 57/2007 regarding the protection of the status of the protected areas, conservation of the natural habitats, etc.)
b) the solicitation is rejected for projects placed in areas with construction restrictions as foreseen in the legislation for the protection of the environment, stating the reasons for rejection
c) the project requires an EIA, including an adequate assessment, by depositing a presentation memorandum (for projects that are subject to art. 28 of the Emergency Ordinance nr 57/2007, including the amendments, and to the Governmental Ordinance 445/2009)
d) the project requires an EIA, by depositing a presentation memorandum (for project that are subject to the Governmental Ordinance 445/2009 but not subject to art. 28 of the Emergency Ordinance nr 57/2007, including amendments).
e) the project requires and adequate assessment (for projects that are subject to art. 28 of the Emergency Ordinance nr 57/2007, including amendments – Provisions Chapter III – adequate assessment shall be applied).

Chapter II describes the procedural steps of an EIA and starts with the **scoping stage**. Once the competent authority has received all the required documentation, it starts the scoping procedure, which includes (as stated in art. 11(1)):

a) analysis on the presentation memorandum registered by the developer
b) the decision on the organization of the CTA
c) analysis of the projects with potential transboundary impacts, for projects falling under the incidence of the 22/2001 legislation
d) filling in the checklist for projects falling in the Annex II of the Governmental Decision 445/2009
e) completes the scoping checklist as presented in the Methodology on the adequate assessment

f) identifies the interested public and announces the deposition of the environmental protection agreement request
g) informs the developer on the method used for informing the general public
h) distributes the project documentation to the members of the CTA
i) convenes the members of the CTA and informs the owner of the project on the time and venue for the presentation of the project
j) finalizes the checklists for the scoping procedure, based on the comments made by the members of the CTA
k) takes a decision in regard to the scoping of the project, in accordance with the provisions set in art. 9 (2) of the Governmental Decision 445/2009.

The result of the screening procedure may have, under the Romanian EIA methodology, **four different requirements** for the next step of the process. The methodology expresses clearly that for each stage of the process, the conclusion reached have to grant permission for proceeding to the next stage. In this regard, the screening results may:

- request an EIA and an adequate assessment for the projects belonging to Annex I of the Governmental Decision 445/2009 and for the projects belonging to Annex II for which it was established that an EIA is needed, as well as for the projects for which it was established that they could have a significant impact on the natural protected areas of community interest
- request just an EIA for the projects belonging to Annex I of the Governmental Decision 445/2009 and for the projects belonging to Annex II for which it was established that an EIA is needed and for the projects for which it was established that they pose no serious threat to the natural protected areas of community interest.
- request an adequate assessment for the projects belonging to Annex II for which it was established that an EIA is not needed and for projects for which it was established that they might have a significant impact on the natural protected areas of community interest (Chapter III Provisions on the adequate assessment shall be applied)

- request the continuation of the procedure regarding the development approval of the project for the projects belonging to Annex II for which it was established that an EIA is not needed and for the projects for which it was established that they pose no serious threat to the natural protected areas of community interest.

Already the screening procedure differentiates the Romanian legislation from the European legislation in as much as the adequate assessment is an integrant part of the EIA methodology, which is not the case for the EU legislation and that the Romanian methodology makes clear distinctions between the competent authorities that decide on the EIA, based on size, location, public involvement or impact it can have on the environment.

The interested public may comment on the decision of the competent authorities already in this stage of the process.

Following the screening stage, within the **scoping** stage, after the afferent tax has been paid, the competent authority for the protection of the environment undertakes the following actions:

a) the documentation deposited by the developer is analyzed
b) the checklist on the EIA process is verified to be in accordance with the methodological guides
c) provides the members of the CTA with the documentation of the project
d) convenes the members of the CTA and the developer of the project for a meeting with the aim to present the checklists for the two procedures
e) offers to the owner and to the public the guidelines on the environmental issues that need to be analyzed within the EIA.

The scoping procedure might require some additional information from the project owner following to the analysis of the documentation. It is important that the content of the guidelines is in accordance with Annex IV of the Governmental Decision 445/2009 and with the methodological guidelines of the EIA procedure.

The third stage, **the quality/ impact analysis of the EIA**, is mainly orientated towards the integration of the general public in the decision-making process, towards the information of the public and towards the organization of a public debate, which allows all the interested citizens to state their opinions on the project. According to art. 21, 22, 23 of the Methodology, the competent authorities play the role of the mediator in the communication process between the developer of the project and the public authority, in the sense that it facilitates the distribution of opinions/documents between the two parties. Once the opinion of the public has been heard and a solution to the concerns raised by the public was provided by the developer of the project, the competent authority, based on the documentation received in accordance with art. 23(1) of the Methodology needs to decide whether the project will receive the environmental protection agreement or the solicitation will be rejected and inform the owner of the project on the decision met. The communication process between the competent authorities, project's owner and the interested public is made based on standard forms which make the object of the Methodology's Annexes. The public's opinion weights heavily on the approval of the environmental protection agreement, since a justified observation on the necessity of additional investigations on the project may determine the competent authority to decide the reopening of the procedure from the moment when the observation was made. Art 26 describes the components of the environmental protection agreement, as foreseen in Annex 18 of the Methodology; these include the reasons why the agreement has been granted, the main measures taken for avoiding, counteraction or reducing the impacts on the environment, etc.

Chapter III of the Methodology is dedicated to the **adequate assessment**, that as earlier presented, under the Romanian legislation, is, for certain projects, part of the EIA procedure and that has to undergo the same screening, scoping and impact analysis steps. The projects falling under the requirements of an adequate assessment are, according to art. 9 (1) – e of the Methodology, the ones presented in art 28 of the Emergency Ordinance nr. 57/2007, including the respective amendments, the projects belonging to Annex II for which it was established that an EIA is not needed and for projects for which it was established that they might have a significant impact on the natural protected areas of community interest, as earlier in this chapter presented. The same screening step is foreseen also for the adequate assessment procedure; at the end of the screening procedure, the decision is taken in regard to whether such an assessment is required or not, based on several actions taken by the competent authority which include visits to the location site, analysis of the documentation, consultations with the CTA or examination of the procedure against the checklist of the Methodology. The same course of action is followed in the case of the adequate assessment: the public is informed on the decision, the opinion of the public is heard and taken into account, and the CTA takes part in the consultations for the final decision, all that being part of the scoping stage. The final decision may either be in favour of emitting the certificate Nature 2000, in conformity with Annex 19 of the Methodology, or go to the next step, that of the alternative solutions, in the case it has been established that the negative impacts are still persistent; **the alternative solutions** may take the form of monetary compensations, if the environmental impact is not significantly reduced, can lead to the granting of the Nature 2000 certificate if the impacts were eliminated/reduced, or to the rejection of the solicitation if the solutions do not reduce/eliminate the impacts. However, the methodology provides with concrete measures to be taken for each case that might arise from mixing the alternative measures that would reduce the impact on the environment.

Chapter IV refers to the confidentiality of the information provided by the developer, and includes provisions on the modality of how certain data may be exempted from being presented to the general public. The data for which a petition of confidentiality may be registered with the competent authority refer to commercial and industrial, as well as intellectual property details.

Chapter V sets the procedures that have to be undertaken for any modification of the project that might arise after the screening phase, after the granting of the environmental protection agreement or the Nature 2000 agreement and before the granting of the development agreement.

As presented in the introductory chapter on the EIA, some of the MS of the EU have set certain provisions regarding the exceptions from the EIA procedure. Art. 41 of the Methodology sets the framework for these exceptions and presents the procedure that are required for such actions. As a compensatory measure, some other assessment form might be necessary to be conducted, or the exception can be granted.

The review and update of the environmental protection agreement are legislated by Chapter VII of the Methodology. A definition of the review and update terminology is provided in paragraph (2), as being ‘any notes registration in annexes and/or modifications of the initial content of the documents’.

The last chapter of the Methodology (VIII) describes the final arrangements in regard to the environmental protection agreement, setting the extreme deadline within which the developer has to deposit the entire documentation (2 years), the modalities for a verification checkup upon the finalization of the projects, as well as making the Annexes an integrant part of the Methodological legislation.

In regard to direct differences from the EU legislation, as they have been pointed out throughout the description of the Romanian EIA methodology, major changes do not characterize the implementation process of the European community law into national law. However, some national particularities are to be observed.

As described in the chapter referring to the Romanian EIA legislation, one of the major differences relates to the adequate assessment procedure that under the national legislation makes the subject of a separate entity, which undergoes itself various steps from formulation until its approval.

Some more details and specificities are given under the Romanian legislation also in regard to authorities that govern the approval of the environmental agreements, or the EIA steps. The Romanian Methodology describes seven different types of projects that are to be governed by the same number of various competent authorities, differentiated on the basis of size, location or environmental implications. Moreover, the Commission for the Technical Analysis is one important body in the EIA process that, under the national legislation, **has** to be formed in the respective county where the project is about to be developed and its constituents are also established by the Methodology. Unlike in the EU, this Commission is the one that has the biggest influence on the authorities in the decision- making process.

The response timescale foreseen for the competent authorities is another point that makes a difference in the Romanian legislation as compared to the EU legislation. The Romanian Methodology of the EIA allows for rather limited timeframes for the competent authorities to respond in each step of the procedure, and sets clear such response periods for each of the EIA stages.

In conclusion, Romania managed to implement the EU environmental legislation of constitutional character in written form and to stay in the same line with the others EU member states in regard to legislation uniformity. It is, however, harder, in particular for a country with limited past experience in the environmental field, to make the transition towards a de facto implementation of the EIA procedures and methodology and to apply in practice the entire new legislation over a short period of time. There have been reported numerous cases where the competent authorities in the country have approved projects without having an EIA, as according to law. In March 2010, the European Commission sent an ultimate warning in regard to the violation of the EIA procedure, as reported on the official website of the European Commission in Romania, for a project that was developed for the production of formaldehyde and that did not presented all the EIA documentation[42].

[42] http://ec.europa.eu/romania/news/evaluarea_impactului_de_mediu_ro.htm

3. Influence of the Wind Energy on the Energy Price

The balance of environmental advantages and disadvantages produced by the wind farms and wind turbines leans more in favour of the maximal exploitation of this type of RES. But what is exactly the role of wind energy on the overall energy price? And how are the consumers affected by the increased amount of energy resulted from wind?

The production price of energy from RES is considerable higher than the production price of energy resulting from primary energy resources, due to various factors, such as the expensive technology used for the capture and transformation of energy from wind, the energy generating capacity which is conditioned by the average speed of the wind, the maintenance and operation costs, etc.

Regardless the location of such wind farms, several factors have to be carefully considered when analyzing the cost of wind energy; it is clear that the wind has no stable intensity or duration of blowing. It is a variable phenomenon influenced by various factors, in particular by the radiation variations to the Earth from the Sun. That is one of the factors that make the wind energy an unstable and unsafe energy generating system when considered as an individual system of energy, and the reason why it was considered to have better results when associated with other types of energy generating systems, as for example, within a hybrid system.

On a global scale studies have established a needed annual wind speed average of 5.8m/s at 10 meters altitude for efficient results considering also the costs involved. The competitiveness of wind energy prices has started to increase in the last ten years, mostly on a large scale (above 10 MW) and the price for kWh has started to decrease as compared to the previous decade. The improvements in the design of the wind turbines, in particular the design of the pallets, have contributed to the reduction of the costs.

In order to understand how the prices of energy are influenced by the wind energy, one has first to understand the variables that contribute to the price variations arising in different steps of the wind energy production.

The installation costs which include the foundation, the construction of the infrastructure for the access ways, communication means, etc depend very much on the area where the future wind farm will be constructed. The final price of wind energy reflects also the operation and maintenance costs that increase over the lifetime of the project. On a global average, the prices range between 0,008$ and 0,003$/ produced kWh and they usually rise by a rate of 2.5% annually[43]. The last figures available, that of 0.013 $/ kWh include also the improvement of the wind turbines technology of the last years. At a first glance it can be easily seen that the cost of technology and of the operating activities such as monitoring the wind turbine and the inspection of the equipment have a direct influence on the final price of energy.

The lifetime of a wind turbine or a wind farm is approximately 20 -25 years, period that represents also the amortization of the capital costs, which range at about 1000$/kW capacity on a global scale[44].

The good news about the costs of energy produced in wind farms is that wind energy has the capacity of becoming competitive, in price terms, with the conventional energy. The prognoses show a very encouraging price of wind energy for the year 2020, 0,003 euro/kWh while the price of conventional energy would be 0.04 euro/kWh[45].

For better forecasts of the price as well as of the electrical energy produced by a wind turbine/ wind farm, a correlation between the resources and the cost are required, as we have already seen that the location of the installation and the wind regimes of the area have a direct impact on the prices. For clear results, and in order to assess the costs of RES should be expressed as a money value, meaning that it should mention how much does a kWh of electrical energy or thermal energy costs, including also the reimbursement period.

[43] Probleme economice, Vol. 360,361,362 “Potentialul de resurse regenrabile pe plan mondial si din Romania. Posibilitati de valorificare a unor resurse energetice regenerabile”, Centrul de informare si documentare economica, colectia Biblioteca economica, 2009, pg 15

[44] Probleme economice, Vol. 360,361,362 “Potentialul de resurse regenrabile pe plan mondial si din Romania. Posibilitati de valorificare a unor resurse energetice regenerabile”, Centrul de informare si documentare economica, colectia Biblioteca economica, 2009, pg 15

[45]

A very important factor in the price fluctuations, mostly applicable for the RES, is the fact that for the systems that function on a random basis, the productivity of the system depends fundamentally on the natural conditions, therefore the investment costs depend on the critical power. As an example, a wind turbine with an energy generating capacity of 1 MW can generate no more than 1 MW, but the generation of power is not constant, as compared to power plants that use fossil or nuclear fuels. Therefore, for installations such as wind turbines, the important factor is the generated power and not the installed power.

The efficiency of RES, which are not based on the classical water-vapour cycle, it is calculated as the average between the energy generated by the system during its entire lifetime and the energy consumed for the production of system. The table below presents the efficiency factors for energy generated by various RES[46].

Table 11 Efficiency factor of the energy generating systems based on RES[47]

Installation	Efficiency factor
Hydraulic of low intensity	80-100
Wind	10-30
Solar photovoltaic	3-6

3.1. Price development in the last years and forecasts for the near future

The wind energy influence on the overall energy price should be, however, considered in the context of the influence the RES as a whole have on the energy price. All the EU strategies encourage the increased production of energy from RES, despite the fact that it has been considered that the increase share of energy from RES should be the main factor

[46] Probleme economice, Vol. 360,361,362 “Potentialul de resurse regenrabile pe plan mondial si din Romania. Posibilitati de valorificare a unor resurse energetice regenerabile”, Centrul de informare si documentare economica, colectia Biblioteca economica, 2009, pg 25

[47] Probleme economice, Vol. 360,361,362 “Potentialul de resurse regenrabile pe plan mondial si din Romania. Posibilitati de valorificare a unor resurse energetice regenerabile”, Centrul de informare si documentare economica, colectia Biblioteca economica, 2009, pg 26

that would lead to an increased energy price. The Romanian Energy Regulatory Authority has issued a report (2004)[48], 'Evaluation of the regulatory framework and necessary actions for the production of electrical energy from RES, in which it presented three scenarios for the price of electrical energy produced from RES. The first scenario presents the minimal prices for the production of energy from RES, the second scenario is based on the average prices for the production of energy from RES, while the third scenario is formed on the basis of the highest prices for the production of energy from RES. Important variables in the development of these scenarios were the national gross consumption of electrical energy for the year 2003 (64, 9 TWh) and the average price paid by the final consumer 62, 59 $/kWh[49]. Moreover the quantities of energy from RES as forecasted for the year 2010, as presented in the HG 1535/2003 were taken into account for the above presented scenarios.

By plotting in the forecasted prices of energy for the year 2010 in the three price scenarios for the amount of energy from RES the following prices have resulted:

- an average production price of energy from RES of 44,6 Euro/kWh (Scenario 1)
- an average production price of energy from RES of 61,9 Euro/kWh (Scenario 2)
- an average production price of energy from RES of and 79,2 Euro/kWh respective (Scenario 3).

Including in the system the transport and distribution variables[50] the average prices for the three scenarios that have to be paid by the final consumers are as follows:

- an average production price of energy from RES of 64 Euro/kWh (Scenario 1)
- an average production price of energy from RES of 81,3 Euro/kWh (Scenario 2)
- an average production price of energy from RES of 98,6 Euro/kWh (Scenario 3).

Considering the price of 53, 2 Euro/kWh for 2010[51], excluding energy from RES, and considering the share of RES for 2010 of 3,9%[52] from the total consumption, the average price for the final consumers become

[48] http://www.anre.ro/documente.php?id=392
[49] http://www.anre.ro/documente.php?id=392
[50] 2010 is the base year for transport and distribution prices

- 53,62 Euro/kWh (Scenario 1)
- 71,14 Euro/kWh (Scenario 2)
- 114, 98 Euro/kWh (Scenario 3).

Therefore an 0, 8%, 2, 1% and 3, 3% increase were calculated for 2010 as compared to the RES share of 2009[53].

A publication of the GDF Suez Energy Romania[54] stated that, based on studies, the wind energy could increase the electrical energy bill of the consumers. According to the calculations, if next year the total capacity installed on the Romanian territory would reach 400 MW, the impact on the electrical energy price could represent an increase up to 5% of the overall electrical energy bill.

When referring to the future, there are some additional recent variables that need to be taken into account for a clear and accurate prediction of price development. Under the pressure of the International Monetary Fund, the European Commission and the World Bank that, earlier this year, have asked Romania to find alternatives to the controlled prices of energy and natural gas and to present a new formula for calculating these prices, Romania finds itself in a difficult position of having to liberalize the energy prices, despite the impossibility of the population to face it. Related to that, there are entitled concerns that the population would come to the situation of not being able to cover the costs for these services. Although the three international actors have demanded a rapid response, the political class aims rather at postponing to a later stage the energy and gas market liberalization, discussions pointing at 2015, once Romania would join the Euro zone. The conflict at the moment relates to the gains and losses that the energy market liberalization would develop. On the one hand, the economy of the country would gain and in this regard the liberalization should be accelerated; on the other hand, there is a certainty that the population would not be in the position to face a liberalized market with

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[51] Probleme economice, Vol. 351,352, 353 “Impactul cresterii preturilor energiei ca efect al uilizarii resurelor regenerabile de energie”, Centrul de informare si documentare economica, colectia Biblioteca economica, 2009, pg 15,16
[52] Ibid.
[53] Ibid.
[54] GDF Suez Energy Romania, Nr. 1 (11). Trimester I 2010, pg 6

the current wage level. For the latter loss of the system, the postponing of the process is regarded as the single valid option, until the moment where the wages of the Romanian citizens become competitive on the European market.
However, to do the European norms that should be applied in Romania as well, the Government made clear promises in regard to developing a calendar by the end of September 2011, that would reflect the liberalization of prices, setting clear increasing tariffs for the period 2013- 2015. As a helping measure the government should define the vulnerable segment of the population, as according to the European legislation for which certain assistance measures would be offered.

On the above presented background, and taking into account that there are some more uncertainties that have direct impact on the energy price, such as for example the excise tax that for the energy resulted from RES might be exempted, or the fact that the transportation costs for electrical energy have increased with 10, 4%, from 17 lei MWh (4,07 €) to 18,77 lei MWh (4,49 €)[55], the forecasts of energy prices become even more uncertain and the calculations of wind energy influence on the overall price hardly predictable. The Governmental decision, still under debate, has as objective the development of a mechanism that enables the consumer to have a solid knowledge on the energy mix that was used for the production of the energy procured by the their supplier and thus, to increase the public awareness and hopefully to motivate the population to choose that particular supplier that uses the largest share of RES in the energy mix it delivers to the consumers. In this regard, the authorities are willing to exempt the excise tax, in order to encourage even more the consumers to opt for the most environmental friendly supplier.

[55] Romanian Energy Regulatory Authority – http://www.anre.ro/ordin.php?id=927

3.2. Investments

The year 2010 represented a **peak year for the foreign investments** made in the Romanian energetic sector and set in the same time an impressive record in the field of wind farms build on the Romanian territory. The country has registered a thirty five times increase of wind energy installed capacity between 2009 **(14 MW)** and 2010 **(476 MW)** and placed Romania on the map of green energy produced in the EU.

The considerable increase was generated by the huge amount of investments that have been made in Romania over 2010 which totalized almost 1 Bill. Euro and which represented one third of the total direct investments made in Romania in the same year. It is worth mentioning that the amount of investments the wind energy sector has attracted in the last year was almost equal with the amount of structural funds the country absorbed from 2007 till the end of October 2010 that is since its accession in the EU. That is more than a considerable amount of money drawn into the country considering that the connection demand of 31.000 MW to the national power grid system has exceeded the capacity supported by the power grid itself. 2010 was an important point of reference also in regard to what the opening of the Romanian wind energy market is concerned. Once the Government has approved the legislation that promoted the energy from renewable energy sources, and the national legislative framework became more reliable for the potential investors, there has been strong competition in the circle of investors willing to set their businesses on Romanian ground.

Apart from the instability of the legislative framework, there were some other factors, which, in the past, prevented foreign investors from choosing Romania as a place for doing business. The instability of the national currency was also regarded as a negative factor, which, through continuous efforts of the governing authorities, was over time stabilized.

The Czech Company CEZ is one of the largest foreign direct investors in Romania and, in the same time the owner of, at the moment, the largest onshore wind farm in Europe. The 600 MW installed wind farm spread around two settlements, Fantanele and

Cogealac, in the Constanta County, Dobrogea region, required approximately 1.1 Bill Euro for its construction, occupying thus one of the first positions in the investors rank in the Romanian wind energy sector. The wind park has 240 individual wind turbines, with a nominal power of around 2.4 MW, their total generated capacity being able to power over 400,000 homes.

Although having an impressive capacity, the Fantanele- Cogealac wind farm will, in the near future, be outclassed by the project announced for Romania by the renewable energy division of the Iberdrola group, Iberdrola Renovables, the worldwide leading company in wind energy[56]. The project has already acquired the right from the Romanian authorities to develop in the South-Eastern European country a project of 1500 MW. Upon its final commissioning it will be the largest wind energy producer in the Romanian energetic sector and will set the stage for the most ambitious project developed in the world, the DOBRUJA PROJECT, which will cover over 50 wind farms and which will be build within the period 2011-2017[57]. The project is expected to bring over 2,5 Bill. Euro to the Romanian economy, accounting for the biggest investor in the wind energy sector, and to cover the demand of over one million households, while reducing the emission of carbon dioxide by approximately 2,6 million tones.

According to the director of the Eolica Dobrogea, Mr. Corneliu Duica, the developer of the Iberdrola projects who is also the Romanian representative of the Spanish company, announced that for 2011 a capacity of 640 installed MW is planned, a new capacity of 500 MW for 2013 and the rest of 360 MW will be implemented until the end of 2017.
However, the amount of investments that the Spanish company is ready to make in Romania has still a potential status and that represents a very important aspect in the discussions on funding made in the Romanian wind energy. The whole expenditure depends on the ability of the sub-companies (e.g. C-Tech, Rokura, Eolica, etc) contracted by Iberdrola to develop the projects, plan and obtain the construction permits in the Eastern area of Romania within a given period of time, and to ensure the Spanish

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[56] According to Bloomberg New Energy Finance
[57] http://www.iberdrola.es/webibd/corporativa/iberdrola?IDPAG=ENMODULOPRENSA&URLPAG=/gc/prod/en/comunicacion/notasprensa/100419_NP_01_EolicoRumania.html

company that a certain amount of MW can be produced. If the companies succeed in their implementation, Iberdrola becomes responsible for the construction and operation of the wind farms. No guarantees are, however, provided for the case when the construction permits are not obtained by the local C-Tech and Rokura companies and the whole investment project fails. Apart from the major project discussed above, in 2010 Iberdrola started the construction on its first wind farm on the Romanian territory, although the 80 MW wind farm installed in the Mihai Viteazu commune, in the same Dobrogea region, which does not fall under the concession granted by the Romanian government. The farm it is expected to be brought into service by the end of this year.

The Portuguese representatives of the Energias de Portugal (EDP) were also interested in the wind potential of Romania and have invested thoroughly in the wind energy sector through their subdivision Renovatio Power. They have taken up projects in Romania that totalize 700 MW; at the beginning of 2010 EDP obtained from the Romanian Energy Regulatory Authority the construction certificate of a wind farm of 33 MW in the Sarichioi commune, Tulcea County.

At the beginning of 2009, 4,7 Bill. Euros were expected to be invested in the national energetic system, once all the wind farms projects would be fully implemented, according to the Romanian Wind Energy Association[58]. Investors like CEZ, Enel, E.ON, EDP Renováveis (EDPR), Iberdrola, Monson, Blue Planet and Ventureal were just a part, however, the most important players on the Romanian renewable energy market, that either were granted connection contracts (1493 MW) or connection approvals (2400MW) to the national power grid system. A simple multiplication of the sum of contracts and approvals (3984MW) with the average cost of one installed MW, 1, 23 Mill. Euro[59], the investment level would reach the amount of 4, 7 Bill. Euro. The finalization of the projects depends strongly on the efficiency of the Romanian government to provide them with a solid background in regard to renewable energy, including the legislative framework, the long term stabilization of the support mechanisms offered by the national

[58] http://rwea.ro/winds-of-profit
[59] For that year, http://www.theinvestor.ro/green-investor/winds-of-profit/

authorities for the renewable energy and the liberalization of energy prices, as a recent topic of debates.

Taking into consideration the situation of the technical connection approval as of 26.01.2011, presented in Annex 1, and the situation of the connection contracts, as of 26.01.2011, presented in Annex 2, the level of investments is expected to rise even steeper in the years to come. Some of the most pessimistic scenarios forecast for the year 2015 funding equal to five Bill. Euro for the Romanian sector of wind energy and a total installed capacity of about 3000 MW, which would outclass the power of four reactors of the Cernavoda nuclear power plant[60]. Studies made by the RWEA show a total of 5630 MW endorsed technical connection approvals and a total of 5271,83 MW approved connection contracts.

The reduced capacity of the national power grid system to take up the large amount of green energy produced in the wind farms build over night and the limited potential of the national transport operator to face the challenge imposed by the unstable nature of the energy resulted from wind build the premises of the necessity of investments not only in the wind parks themselves but also in the development and expansion of the Romanian power grid system. The companies were faced with the situation where they had to improve the efficiency of the power grid up to the point where it became able to carry the energy produced by their own wind farms. After having invested in the same region, as most of the foreign investors in the Romanian wind energy, the Czechs from CEZ have funded the 400kV power station that will assure the connection to the National Power grid of about 2000 MW, mostly produced in the wind farms build in the region. After two years of planning and construction, on May, 17th 2011 the Tariverde station (Constanta County) was officially inaugurated and set in motion for the evacuation of the energy produced in the local wind farms, according to Transelectrica. The project, which totalized 26,5 Mill. Euro, was funded by the CEZ company and partly from the connection taxes to the national power grid system[61]. The Tariverde station is considered

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[60] http://www.businessmagazin.ro/analize/energie/energia-eoliana-mit-sau-realitate-7977439
[61] http://www.transelectrica.ro/news.php?cod=120

to be one of the many such stations which will be built in the near future and that will make possible the exploitation of the wind resources under the best conditions.

The main investment projects, as published on the website of the Romanian Ministry for Economy, Commerce and Business Environment show that up to the year 2010, several project were developed in order to improve the performance of the Romanian power grid company, Transelectrica; the total amount, as shown in the table reached a value of 443,10 Mill. Euro and as described in each project separately, the structure of the shareholders was divided between the Ministry of Economy (73, 7%), the Ownership Fund/ "Proprietatea" Fund (13, 5%) and other share holders, below 12, 8%.

Table 12 .Main Investment Projects – Romanian Power Grid Company "Transelectrica" [62]

ROMANIAN POWER GRID COMPANY "TRANSELECTRICA " Transelectrica - the Romanian Transmission and System Operator (TSO) responsible for electricity transmission, system and market operation, grid and market infrastructure development, ensures electricity exchanges between Romania and other countries from Central and Eastern Europe, www.transelectrica.ro			
No.	**Project code**	**Project name**	**Total estimated value (EURO, million)**
1	E.TR.1.10	Rehabilitation Station/Substation 220/110 kV Turnu Severin Est **-PPP**(1)[63]	16.70
2	E.TR.2.10	Rehabilitation S/S 400/110/20 kV Tulcea Vest **-PPP**(1)	44.50
3	E.TR.3.10	Rehabilitation S/S 220/110 kV Barbosi **-PPP**(1)	8.00
4	E.TR.4.10	Rehabilitation S/S 400/110 kV Bacau Sud **-PPP**(1)	10.10
5	E.TR.5.10	Rehabilitation S/S 400/110 kV Roman Nord **-PPP**(1)	7.60
6	E.TR.6.10	Rehabiliattion of 400/110/20 kV Domnesti substations **-PPP**(1)	55.00
7	E.TR.7.10	Rehabilitation of 220/110/20 kV Campia Turzii substation **-PPP**(1)	22.40
8	E.TR.8.10	Connection the 400kV OHL Isaccea-Varna and 400kV OHL Isaccea-Dobrudja in the 400kV substation Medgidia Sud **-PPP**(1)	20.00
9	E.TR.9.10	Extending the 400kV substation Cernavoda by connecting to the Romanian Power System the units NPP U3 and U4 and strengthening the Power Transmission Grid by constructing the 400kV d.c. OHL Cernavoda –Stalpu and connection in the 400kV substation Gura-Ialomitei **-PPP**(1)	100.00
10	E.TR.10.10	Convertion to 400 kV of the axis Portile de fier-Resita-Timisoara-Sacalaz -Arad **-PPP**(1)	111.00
11	E.TR.11.10	The 400 kV interconnection OHL between Resita (Romania) and Pancevo(Serbia)	37.00
12	E.TR.12.10	Rehabilitation S/S 110/20 kV Suceava **-PPP**(1)	10.80
		TOTAL TRANSELECTRICA	**443.10**

[62] http://www.minind.ro/

[63] PPP – Public Private Partnership

The increased interest for the Romanian wind sector has attracted not only wind power producers but also the producers of sub-ensembles and wind turbine equipment have seen the same great opportunity of setting their business on Romanian ground. The Chinese and the Swiss companies are promising investments of tens of millions of Euro for developing in Romania the industry of components for the wind turbines. The Chinese company United Electric plans to expand its activity already started in Parscov[64], by investing up to 50 Mill Euro in a factory that produces components for the wind turbines. According to the company's manager, Mr. Jack Go, the decision of investing in this field came on the background of the increased interest of several other Chinese companies that plan to develop wind farms up to the total potential of 500 MW[65].

The Swiss company Windex aims at developing a factory in the same industry, even closer to the focal point of the wind farms expansion, in the Constanta County. An investment of 25 Mill. Euro is foreseen for the factory that will produce wind turbines with a capacity varying from 250kW up to 2,5 MW and that will employ around 100 people[66].

The growing number of wind turbines on the Romanian territory attracted also the largest wind turbines producers in the world, the Danish company Vestas, which at the beginning of this year opened the first dealer shop in Romania. Hansk Rieks, the vice-president of Vestas for Central Europe saw the business potential in Romania, which in his opinion poses the wind sector with the greatest growing potential for Central and Eastern Europe. The most recent offer concerning the investments in the Romanian wind energy comes from the American company Groupe Concorde Developments (GCD) that not more than one week ago, on the 16th of May announced the cooperation with the Romanian Government and with the European Union for their next two projects that are about to the developed on the energetic market. The first project refers to a wind park that will be constructed on the Romanian territory, in Tulcea, having an installed capacity of 45 MWh for which 90 Mill. Euro were allocated. The second project is still under

[64] OXYGEN- Energy for business magazine, a publication of the GDF Suez Romania, nr. 4(10), pg 8
[65] http://www.money.ro/chinezii-si-elvetienii-investesc-in-producerea-de-turbine-eoliene-in-romania_761671.html
[66] OXYGEN- Energy for business magazine, a publication of the GDF Suez Romania, nr. 4(10), pg 8

negotiations and upon its finalization 120 permitted MWh belonging to a Greek group acting on the Romanian market will become the property of the GCD[67].

On an overall European level, the investments made in Romania accounted for a 5% of the total investments made in wind farms made within the European Union, according to the publication of the GDF Suez Romania[68].

3.3. Subventions

It has been globally established that market growth in the environmental sector it is driven primarily by legislation, be it nationally or internationally, in particular for those markets that have achieved their maturity, as the case of the EU or US[69]. This was also the role of the Kyoto protocol: to set legally binding targets for the developed nations and for some developing countries, in the attempt to start the fight against climate change.

In order to comply with the targets agreed upon in the Directive 2001/77 and taking into consideration the high costs of energy production from RES, each country confronted itself with the necessity of establishing appropriate financial support mechanisms that would encourage the production of energy from RES and that would in the long term promote the RES on a macro scale.

The Directive 2001/77 imposed no clear rules on the method the Member States have to develop such support mechanisms, but allowed the EU countries to establish their own schemes, as long as they are compatible with the principles of the internal energy market, they actively promote RES and as long as the support is provided for a period of minimum 7 years, so that the interest of the investors is maintained[70].

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[67] http://www.prnewswire.com/news-releases/ramoil-management-ltd-otcramo--groupe-concorde-developments-inc-details-1st-two-projects-121884858.html

[68] OXYGEN- Energy for business magazine, a publication of the GDF Suez Romania, nr. 4(10), pg 8

[69] European Institute of Romania, "The impact of the implementation of the Energy-Climate change package on the Romanian economy"; Strategy and Policy studies no 5, 2010

[70] European Institute of Romania, "The impact of the implementation of the Energy-Climate change package on the Romanian economy"; Strategy and Policy studies no 5, 2010

The Romanian market required even stronger financial support mechanisms that would overcome the existing barriers, such as large economies of scale, bureaucracy, the antiquated and poorly developed infrastructure, which would have reduce the interest of the investors, despite the fact that it is a relatively new market.
Before describing the financial support mechanisms developed by Romania I will make a brief presentation of the three main schemes developed within the EU, with their respective advantages and disadvantages.

The feed-in-tariff system it is based on a fixed tariff (feed-in-tariff) of the energy from RES that has to be paid by the producers, suppliers or consumers; the value of this tariff it is established based on the production technology used and can be differentiated on types of technologies, can be set as a fixed value, which most of the times is valid for several years in order to secure the investments, or can register fluctuations over periods of time. According to the national characteristics, the importance and the level of such tariffs can have significant variations form country to country.
The advantage of this system in terms of efficiency is the fact that it is an easy applicable system, although the rules of costs allocation could be a bit more complex; it is a transparent system that permits the identification of the beneficiaries. However, it does not guarantee the compliance with the target. When considering the cost effectiveness of the system, the feed-in-tariff mechanism proves to be a low efficient mechanism as to what the cost are concerned, but it does not involve administration costs; the producers are given no incentives to produce at lower costs; a possible solution for this system would be the differentiated feed-in-tariffs according to types of technologies. In terms of investment safety, it is the most secure system, as it assures the investor in regard to the total refund of the financial means involved. For this mechanism, a long term contract is an essential key for the investors[71].

[71] Probleme economice, Vol. 351,352, 353 “Impactul cresterii preturilor energiei ca efect al uilizarii resurelor regenerabile de energie”, Centrul de informare si documentare economica, colectia Biblioteca economica, 2009, pg 15,16

The second system is **the quota system**, where the governments of the countries set a quota of energy produced from RES that can be purchased by the producers, supplier or consumers; the price it is established on a competitively basis. The compliance with the quota system can be proved by the numbers of green certificates obtained throughout a year, otherwise penalties shall be applied. The overall perception in regard to this type of financial support is that the mechanism does not encourage the competitiveness, being very often criticized[72].

The efficiency of this system is based on the guaranteed fulfillment of the set targets due to the obligations imposed to the producers, suppliers and consumers and on the transparency of the targets; the cost efficiency of this system counts some disadvantages; in the case of shortage of energy, if penalties are applied, the prices will rise in the long term. On the same side of disadvantages, this mechanism triggers some administration costs that have to be included in the final price of energy. It is not a very safe mechanism for the investors, because of the potential price variations on the energy market. The main advantage of the quota mechanism is that it permits the creation of a side 'green certificates' market that does not interfere and produces no disturbances on the electrical energy market.

The third system is the **auction system** that involves regular auctions, for various technological groups, for the purchase of a specific quota of energy resulting from RES. The contract is adjudicated by the producer that offers the lowest price.

It is not possible to assess one or another mechanism as being the best on the market, since the evaluation has to be made in within the national context of a country and regarding the specificities of the Member States. Along the same line, one has to consider that various systems were developed on the European market for the promotion of the RES, but each of them was applied considering the national targets and the national goals. In this regard, the industrial development, the employment rate, the emission reduction necessities, different production levels, or the domestic resources allotted for

[72] Probleme economice, Vol. 351,352, 353 "Impactul cresterii preturilor energiei ca efect al uilizarii resurelor regenerabile de energie", Centrul de informare si documentare economica, colectia Biblioteca economica, 2009, pg 15,16

the green energy have played an important role in the decision concerning the type of system that should be applied for the respective country.

In 2003 the Romanian government has approved the strategy for the exploitation of RES, and decided that the system which suits the country best should be a mix of obligatory quotas and green certificates. The green certificates are documents that validate the distribution of 1 MWh of energy from RES to the national grid system. The green certificate functions on a separate market from the energetic market, without being attached to the energy it represents, enjoys an unlimited validity and its price fluctuates according to the mechanisms of a liberalized market.

This new system was set for a first period of 15 years with the possibility to extend the period, depending on the results obtained. In the attempt to comply with the overall national target for 2010, the Romanian Government has set progressive, binding targets for the share of energy from RES that has to be supplied to the consumers. In this regard, the following targets were set for the respective year, as a share of the annual gross domestic consumption of electricity: 2, 2% for 2006; 3, 74% for 2007; 5, 26% for 2008, 6, 78% for 2009 and 8, 3% for 2010. Following the same progressive share of the energy from RES, in 2011 a 10% share of the electrical energy is expected to come from RES, 16% for 2015 and 20% for 2020, achieving the targets imposed by the EU[73].

As already stated, the Directive 2001/77 sets no binding rules for how the Member States should implement the supporting mechanisms for RES, therefore Romania, as well as any other European Union Member is free to choose the distribution of certificates for each type of RES. Given the fact that some of the RES were encouraged more than others, taking into consideration their national potential as well as the so far investments made in that particular field, Romania has decided to make a differentiation also in the number of certificates allocated for each MW of electrical energy distributed to the national grid

[73] Probleme economice, Vol. 351,352, 353 "Impactul cresterii preturilor energiei ca efect al uilizarii resurelor regenerabile de energie", Centrul de informare si documentare economica, colectia Biblioteca economica, 2009, pg 20, 21

system. After having discovered the enormous wind potential the country had to offer, the increased interest of the investors in this area and also the highly developed technology of the past couple of years, the Romanian Government has decided to allocate 2 green certificates for each 1 MW of electrical energy distributed to the national grid system. A higher number of green certificates were allocated just for solar energy and biomass, as the share of solar energy in the total share of energy from RES was the smallest and had the lowest increase over the last decade, despite its considerable potential, while the biomass is a national resource with an increased economical benefit.

The actual policy developed and validated through the legislation 220/2008 for the implementation of the Directive 2001/77 grants 2 green certificates for 1 MW of wind power, 3 green certificates for 1 MW of biomass and 4 certificates for 1 MW of solar power. The same piece of legislation extends the validity of the obligatory quota system until 2012, and sets highest and lowest price limits for the transaction of green certificates on the market, with the lowest value of 27 €/green certificate and the highest value of 55€/green certificate. As an example, the lowest price registered for 2005 was 125 RON (24€) per certificate and the highest price had a value of 150 RON (42€) per green certificate. Within the legislation it is also clearly mentioned that the cost associated with the connection to the national power grid system should be split, equally, between the producers, the Transport and System Operator and/or by the Distribution operators. However, the wind power will benefit from two green certificates for each MW distributed to the national power grid until 2017; afterwards for 1 MW of electrical energy resulting from wind power, the producer will receive only once certificate, as in the case of hydropower.

The most important mechanism within the system of green certificates is the sanctions section. In the case that one energy producer had failed to reach the imposed target, the price of one green certificate increases tremendously, up to the value of 110 €, forcing the supplier, producer, etc to strive for reaching the targets.

Apart from all the above mentioned financial and administrative supporting systems, Romania strongly encourages the production of electric energy from RES, in the last years, in particular the energy resulting from the wind farms. One of the reasons behind this strategy is the large volume of investments that the wind potential has attracted towards Romania and the job market created together with it. Huge emphasis it is laid on the wind energy industry in the last two, three years and the interest in the field, of both the Romanian Government and foreign investors it is expected to rise even more.
That is why at the moment, wind energy is the only RES for which projects are developing in Romania.

3.3.1. The Romanian System – actors and functioning

But who are the actors of the Romanian green certificates market? Who can conclude transactions within this field? First of all is the Romanian Energy Regulatory Authority – ANRE-, the producers of electrical energy from RES, the suppliers, the transport and system operator – ETS- and SC OPCOM SA, which is the operator of green certificates, setting the prices and assuring the good development of the green certificates.
The ANRE is the agency that grants the permission to the producers of electrical energy from RES to take part in the green certificates market and also the body that sets the highest and lowest prices for the green certificates. It is the core part of the whole system that verifies if the suppliers comply with the quota and the one that applies the sanctions if the situation requires it.
The producer of electrical energy from RES is the one that sells the electrical energy from RES on the electrical energy market at the market price. The producer receives two certificates for each MW delivered to the national power grid to cover its expenses and to

generate some profit. In 2009, in Romania, the Romanian Energy Regulatory Authority registered 22 producers[74].

The suppliers of electrical energy have the role of demonstrating that the quotas have been reached through the number of green certificates they poses. The number of green certificate should be equal to a value given by the multiplication of the obligatory quota and the quantity of electrical energy distributed annually to the final consumers. In case of non-compliance they bare the sanctions set by the ANRE. The number of suppliers for 2009 reached 63 as registered by ANRE[75].

The system and transport operator (OTS) is the body that quantifies monthly the amount of electrical energy from RES delivered to the national power grid, emits, accordingly to the delivered quantity, a number of green certificates for the producers and collects the payments coming form sanctions at the end of the conformity period. In Romania Transelectrica is the national OTS that manages, operates, modernizes, develops and maintains the electrical energy transport network, that according to its official website, includes 78 electrical energy transformation stations, with a total capacity of 35.000MVA and 9.028 km of electrical lines in the air of 110/220, 400 kV and 750 kV, all divided between the eight transport divisions.

The last player on the green certificates market is SC OPCOM SA, the body that registers the participants to the green certificates market, makes prognosis and publishes the supply and demand of green certificates at a national level, registers bilateral agreements taking place between the producers of energy from RES and suppliers. OPCOM represents also the administrator of the green certificates market and makes sure that the participants have a solid framework to promote their activity.

[74] Probleme economice, Vol. 351,352, 353 "Impactul cresterii preturilor energiei ca efect al uilizarii resurelor regenerabile de energie", Centrul de informare si documentare economica, colectia Biblioteca economica, 2009, pg 23

[75]Probleme economice, Vol. 351,352, 353 "Impactul cresterii preturilor energiei ca efect al uilizarii resurelor regenerabile de energie", Centrul de informare si documentare economica, colectia Biblioteca economica, 2009, pg 25

The system of green certificates it is based on two major characteristics: the operated quantity has a fixed value, imposed by the state policy and the price of the green certificates is, as in the case of all goods being transacted on a free market, triggered by the market mechanisms. There is a supply and demand for green certificates; the supply is assured by the producers of energy from RES, while the demand comes from suppliers or from the consumers themselves. These are the specificities of a so called voluntary system; on the other hand there is also the possibility that the demand is set by the quotas imposed either to the suppliers and producers or to the consumers, at a national level. In the case of Romania, the legislation imposes specific quotas for the suppliers of energy from RES. The final consumers are allowed to take part in this system, but on a voluntary basis; their implication is not obligatory.

The producers and suppliers, would, therefore, perform their activity on two separate markets: the electrical energy market, where they make transaction with electrical energy and the green certificates markets, where the benefits paid to the environment are exchanged through the production of green energy. It is, however, important to mention that the two goods exchanged, the green certificates and the electrical energy are independent one from another; when a supplier buys electrical energy from a producer, it does not have to buy also the green certificate associated with it. The system of green certificates was successfully used so far in other countries of the EU, as well as outside the EU.

As the energetic system and the energetic market function on the premises of strong interconnections, it is impossible to left aside the factors that influence not only the volume and share of the wind energy distributed to the consumers but also the transactions happening on the green certificates market. The volume of transactions it is, inter alia, influenced also by the capacity of the national power grid to take up and to deliver green energy to its consumers. It is, therefore, important to briefly analyze the role of the national transmission system in the context of the national power grid system.

3.3.2. The National Power Grid system

The Romanian energetic system is, at the moment, the same one existing in 1989, based on a restraint number of interconnectivity lines, in conformity with PE 026, having a peak value of 12000 MW (and an increasing tendency of 15000MW after 1995) and a number of hours of maximum power utilization reaching 6600 annually; at the moment the production it is still based on coal and a considerable share of energy coming from thermo power plants and on several accumulation lakes.

Over the years attempts were made to develop the interconnectivity system and this led to an increased export and number of bilateral contracts coming from energy produced in the hydro power plants. In the last two years, the national power grid system has increased its lines and areas of electrical interconnectivity to Hungary, through the Arad-Sandorfalva, Nadab – Beckescsaba lines as well as through the new domestic internal lines Arad- Nadab and Oradea- Nadab.

Starting already with 1995, the technologies used in over 15 electrical power stations have been improved, although compared to the total number of power stations in the country this represents just a reduced share.

The fact that the Romanian national power grid encounters difficulties seems at a first sight rather strange. The congestions that burden the power grid are mostly a cause of the management of the electrical power plants within the electrical energy market and not necessarily a matter of lack of capacity of the power grid itself. The first difficulties relate to the difficult integration of some of the power plants into the national energetic system due to inconsistencies between the frequency and the power differences.

In particular for wind farms, the difficulty of integration the energy produced into the national system and connecting the wind turbine itself to the national power grid requires a very strong influence of the OTS (the Transport and System Operator), which has to continuously balance the variations between the prognosis of wind energy produced and the real production of energy. OTS had always to rely on its reserve, strongly depending on the prognosis provided by the National Authority for Meteorology. Even when provided with extremely accurate prognosis, OTS has to anticipate a difference between the forecasted energy production and the real production of up to 15% of the installed capacity[76].

Aiming at meeting the targets set by the EU in regard to the change in the structure of the electric power producers for covering the domestic energy demand and following the analysis of the operating mode of the National Power System in the perspective 2014-2019, changes have appeared also in the Romanian transmission system lines within the national power system. Several studies have been conducted in the attempt to set the basis for a future strategy regarding the necessities and opportunities of building supplementary transmission lines and consolidate the existing system up to the point where it can, on the one hand support the increased energy flow, generated by an increased demand, and, on the other hand, become more competitive on what cutting the losses within the system is concerned. The research conducted by the Institute for Studies and Energetic Projections (ISPE) played an important role in the decisions met to build and considerably improve the existing national power grid system. An example of how the wind potential of the Eastern region of the country has lead to an extension in the structure of the NTS is presented below.

The evolution of the electric power balance for the period 2009-2014 was made according to two major variables: the existing international financial and economic crisis and the objectives set by the EU for increasing power efficiency.

According to ISPE the net electric power demand will vary between 52.8-57.5 TWh and 57.8-65.6 TWh for the upcoming 2014-2019 period, and a net internal consumption of 8600 MW for 2004 and a value of 10000MW for 2019 considered in the analyses regarding the development of the electric networks of the NPS have the highest

[76] Energetica, Nr. 11, Noiembrie 2008 – Integrarea centralelor eoliene si calitatea energiei electrice in Sistemul Energetic National din Romania – IRE – Insitutul Roman pentru Studiul Amenajarii si Folosirii Surselor de Energie, pg 440

probability (95%) of being carried out[77]. In order to cover the demand and to maintain conformity with the legislation and objectives set at community level and taking into account also the multiple connection demands from investors in wind power plants with an installed capacity ranging between 2235 and 14200 MW, as presented in table 8, the ISPE has concluded that the a new section in the national power grid, between Gadalin and Suceava is necessary and opportune from 2014 because it increases the reliability of the national power system and removes overloads. In addition to that, a new transmission line would increase the operating flexibility and reduce the power losses in the NTS (The overall reduction in the power losses in the NPS to peak load is approximately 35 MW[78]). Studies have shown that for the year 2019, in particular for Moldova region, wind power plants would reach an installed power of 2740 MW, which would not be operable without this particular section of Gadalin- Suceva 400 kV OHTL in the national power system.
Looking from an economic point of view, the economic indicators support the construction of this line, as the present recovery duration of 6 years of this project demonstrates its feasibility and the internal rate of return rises up to 37%. A profitability index of 3.7% and present net income of 227 mill Euros bolster even stronger the Gadalin Suceava transmission line[79].

As this particular example, there are some other influences of the wind potential and in particular of the investors interested in the wind sector of Romania that have contributed to the changes that took place and that will continue to take place in the Romanian National Transmission System

The challenges faced by Romania, in regard to the enlarged share of wind energy in the energetic mix is not singular and posses no national character; some other countries have

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[77] Necessity and Opportunity of building a new 400 kV OHTL between Gadalin and Suceva in the context of the European Union requirements regarding the environment, security of supply and electricity market; ISPE Bulletin, VOL 53.- nr. 4/ 2010, Bucharest, 2010, pg 33
[78] Necessity and Opportunity of building a new 400 kV OHTL between Gadalin and Suceva in the context of the European Union requirements regarding the environment, security of supply and electricity market; ISPE Bulletin, VOL 53.- nr. 4/ 2010, Bucharest, 2010, pg 37
[79] Necessity and Opportunity of building a new 400 kV OHTL between Gadalin and Suceva in the context of the European Union requirements regarding the environment, security of supply and electricity market; ISPE Bulletin, VOL 53.- nr. 4/ 2010, Bucharest, 2010, pg 37

confronted as well with integration problems, that in the end lead to the changes within the distribution and transmission grids, technical codes or even tariffs.

3.3.3 The challenges faced by the Romanian system

It is highly important to mention the challenges the Romanian system has to face in regard to the implementation and development of wind parks in the country, as they will be, in one or another way, reflected in the price of the energy and in the burdens laid on the energetic system. Each country conducts its own energetic policy, following its own rules of transition from a system based fairly on primary sources of energy to a system imposed either at European level or international level, aiming at reducing as much as possible the effect of GHG on the environment.

As compared to other countries that have implemented the green energy, and in particular wind energy, step by step, once with the technological developments (as it was the case of Germany, Denmark or Spain) or that have a reduced share of green energy produced by wind turbines (as in France or Hungary), Romania had an explosion of wind farms, growing from just a few MW installed to several thousands MW in just couple of years. Taking into consideration the average period of about two years for the complete implementation of a wind farm from the moment it receives the technical connection approval up tot the commissioning period, the national power grid system may be confronted with an inexperienced situation of having to take up more than 3600 MW, which is the 30% estimated production out of the installed capacity in the near future.[80]

[80] Energetica, nr. 11, Noiembrie 2008, Integrarea centralelor eoliene si calitatea energiei electrice in Sistemul Energetic National din Romania, Institutul National pentru Studiul Amenajarii si Folosirii Surselor de Energie, Bucuresti, 2008, pg 444

The particularities of the integration of the wind power in the national transportation system have to be analyzed on the background of its appearance in Romania linked with the international context:

- it happens in the context of global technological changes; the transition to a new technology may affect Romania in the sense that the old turbines that are being phased out in countries such as Germany or Denmark could be transferred to the Romanian sector
- the support provided at political level may translate in preferences given by Transelectrica to connect to the National Transmission System to all wind energy producing operators
- according to a study published in the magazine Journal of Geographic Research, in September 2004 at Stanford University, the wind potential for different regions of the world was analyzed and ranked on a 1-9 scale; it was concluded that the wind potential could be economic beneficial if it emerges from a three or higher class, Romania being included in the classes one and two and requiring thus an even larger reserve to cover for the inconsistencies of the wind potential.
- the concentration of the wind power plants in the regions where no important demand of energy was registered (Dobrogea and the Eastern part of Moldova); that implies a strong power evacuation capacity from that area.
- the location of the wind power plants very close to the first and second reactors of the Cernavoda nuclear power plant has been avoided in other countries
- location of the largest wind power plants (> 600 MW) within one wind passage
- the development of the variable power very close to the boarder lines

4. Storage capacity

The storage of wind energy, in particular, and of energy produced by RES, in general, has represented a problem ever since the production of energy from RES became an activity of large proportions.

The uneven generation of energy from RES and its unreliable and inconsistent nature, which at the moment can not be controlled by human activities, make the RES an extremely demanding and hardly utilizable cost-efficient technique, and slow down the expansion of wind energy production. In the same time these features have imposed the need of a storage system that has the role to take up the extra energy produced, which exceeds the demand, and to return it into the system, at a later stage, when the demand overtops the supply, by overcoming the fluctuations. There have been numerous studies regarding the possibility of improving the wind energy storage capacities and the methods associated with the storage of this green energy have evolved considerably, making the whole system a competitive one. A brief description of the modern methods is presented below, followed by the particularities of the Romanian energetic market.

4.1. Methods and Technologies

The methods of wind storage are continuously being tested and developed, some of them being already implemented into small scale, commercial applications. So far wind energy was associated with the following methods in terms of storage capacity: pumped hydro storage, battery storage, compressed air storage, thermal storage (such as molten salt), flywheels, superconductors, and hydrogen separation and storage. However, only some of them are considered most practical and adequate for wind storage, as follows:

- pumped hydro storage: this method refers to the practice of pumping water to an upper reservoir with the help of wind energy, whenever the opportunity arises, and the production is larger than the consumption of energy, that is during off peak demand, and then release the water through a small hydro turbine to generate electricity during peak demand hours when the rates are higher[81]. What happens in this case is that the wind energy is converted into potential energy for later use, its main disadvantage being connected to the capacity of storage that is limited on the upper and lower reservoirs. In this method, the landscape plays an important role, as the geographic elevation difference should allow for water to fall naturally. The process is described by the picture below.

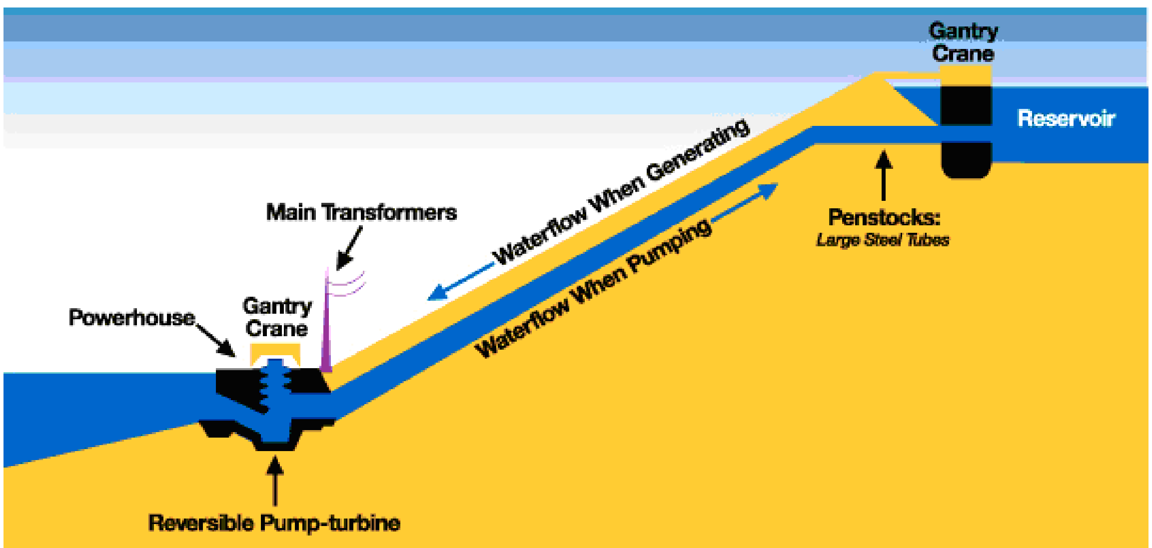

Figure 4 Pumped- storage Plant (Pumps could be operated by wind power)[82]

- Compressed air storage – The compressed air storage method uses wind energy to compress air and store it into abandoned mines or in caverns underneath the Earth. The air is then released whenever the demand of energy increases; the air is run through a gas turbine, mixed with natural gas to burn as regular fuel. In this way, electricity is generated, although the efficiency of the method depends strongly on the volume of the storage deposits underneath the Earth, the air pressure of storage and on the location of the wind farms in connection to the

[81] Wind energy storage, Tim Ernest, Harris Group Inc. http://www.epoverviews.com/oca/Wind%20Energy%20Storage.pdf

[82] http://www.consumersenergy.com/content.aspx?id=1830

location of the underground caverns. It is a procedure that was commercially used in the United States of America and is represented in the picture below.

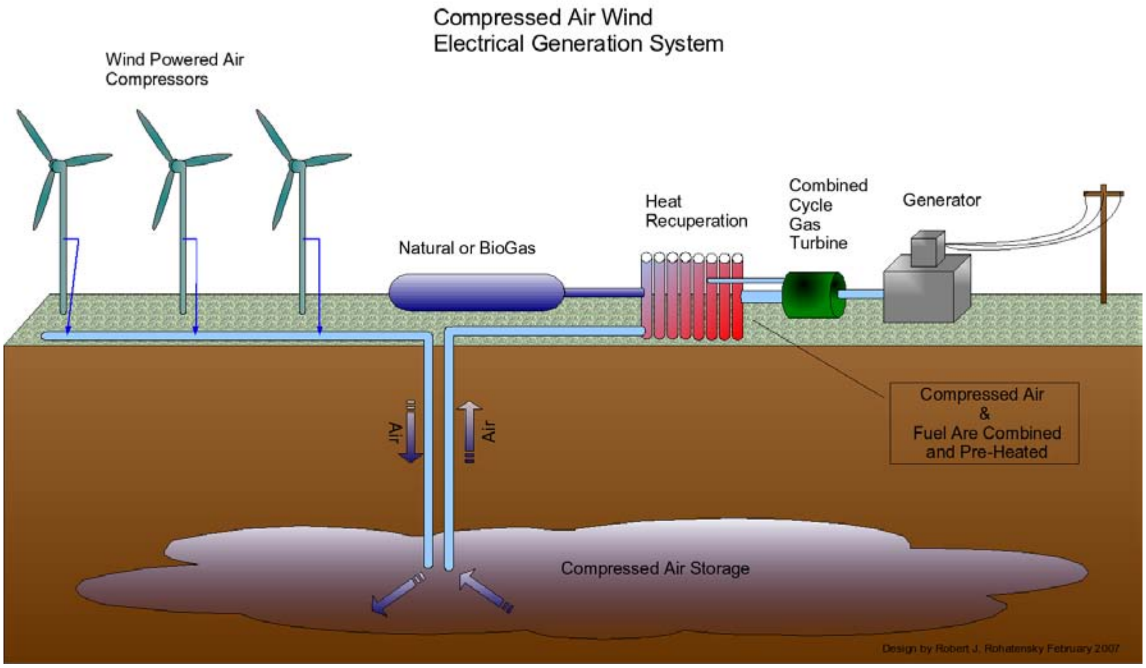

Figure 5 Compressed Air Storage (Pumps could be operated by wind energy)[83]

- Flywheels – Although this method is still in a developmental stage, it is considered to be very efficient for small power plants. The flywheels are mechanical devices that store the energy coming from the wind farms in a rotating mass in form of kinetic energy; the wind energy generates an electric motor that spins the flywheel and in this way the energy produced is absorbed. The energy stored is later on released by the electrical generator that uses the energy produced by the flywheel's momentum. For this method, the capacity of the energy stored by the rotating speed of the flywheel and by the number of flywheels coupled in the system. The principle is described in picture3.

[83] www.shpegs.org/images/cawegs

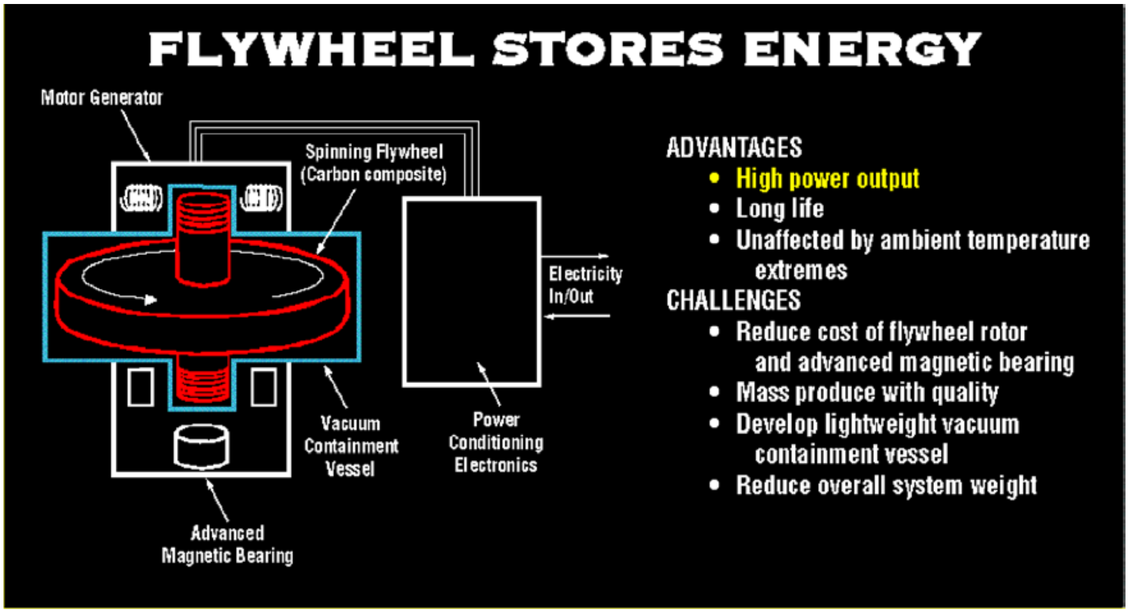

Figure 6 Flywheel system – Activated by wind energy

- Battery storage – despite its popularity, the method of storing energy into battery encounters several problems, such as the size of the battery, the capacity of the tanks, or the lifetime of the batteries. As described in picture 4, the batteries utilize charged electrolytes to store the energy, using proton exchange membranes similar to fuel cells.

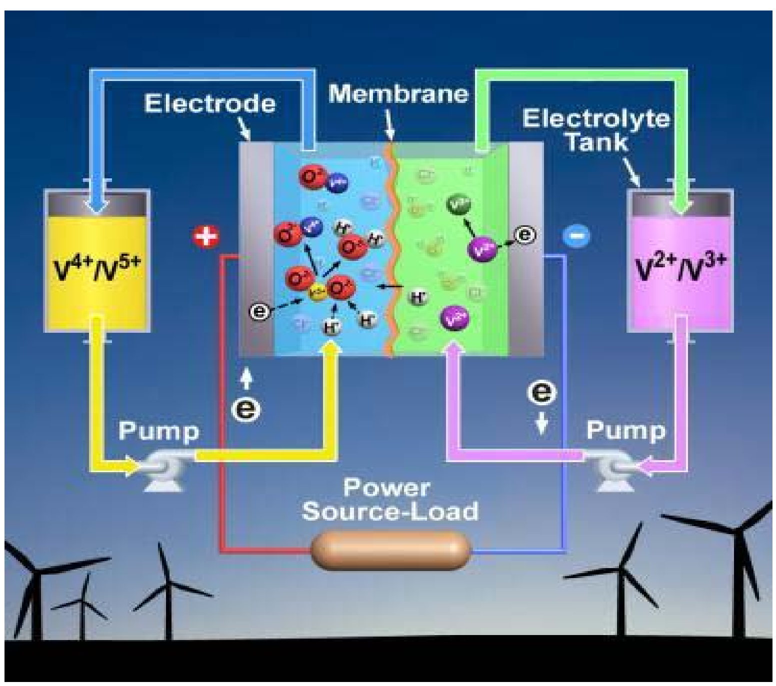

Figure 7 Flow Battery representation (powered by wind energy)[84]

[84] http://www.google.at/imgres

Despite the multitude of energy storage techniques that have been developed over the years with the aim to make the RES an even more attractive and efficient source of energy, I will only limit myself to the above presented methods, chosen based on their rate of utilization, on their achieved progress and on their forecasted success for the future.

4.2 The Romanian storage system

The increased interest for the Romanian wind potential combined with both the necessity to comply with the European rules in regard to the share of RES in the total energy mix and the requirements imposed by the national power grid system for an efficient integration of the energy produced in the constructed wind farms, have made the authorities much more aware of the imperious need of developing a method of storage and appropriate systems.
The Romanian scientists have explored various possibilities of storing renewable energy, even during communist times, but the restrained access to information and the technologies of that time made the difference in the small progress achieved.

Starting already with the last years, the authorities in charge have made important steps forward to assure the coordination of the produced energy with its integration in the power grid system, but concrete results are still lacking behind.

From the above presented storage methods, Romania has opted mainly for pumped hydro stations, coupled also with the substantial hydropower potential of the country, that in 2007 was evaluated at 36000GW/h[85], out of which 30000GWh were considered to have also an economic potential for development. In the attempt to diminish the negative effects on the environment of energy produced from conventional sources of energy and aiming at complying with the European legislation, the Romanian authorities took advantage of the opportunities it has been given through the adherence to the European

[85] Strategia Energetica a Romaniei- 2007-2020, Ministry of Economy
http://www.minind.ro/presa_2007/septembrie/strategia_energetica_romania.pdf

Union of accessing the European structural funds for the energetic field and by attracting the foreign investments for RES. The funding was allocated for satisfying the demand of system services on the internal and regional market and for the optimization of the national energetic system. In this regard, the realization of a pumped hydro station used for storing energy from RES, including the forecasted energy generated by the Reactors 3 and 4 of the Cernavoda nuclear power plant as of 2017 became the priority measure in the field of production, transport and distribution of electrical energy.

The pumped hydro station project in Tarnita-Lapustesti has the key role to assure the variations in the energy consumption and to be the link between the energy resulted from RES and its most efficient integration in the national system. Tarnita-Lapustesti is the sole such project developed on the Romanian territory and is indented for public utility.

The main investments considered for the period 2007-2020, include, inter alia, under the hydro energetic field, special funding for developing the CHEAP Tanita-Lapustesti, having an installed power of 1000 MW. The objectives of building such a plant, as well as the funds allocated for it, have been included in the National Energetic Strategy for 2007-2020, approved through the Governmental Decision nr.1069/2007.

A Memorandum of the Ministry of Economy established the organizational arrangements as well as the commitments undertaken by the Romanian state and credited Hidroelectrica, the Romanian leader in electric energy production and the main distributor of technological system services in the country, with the portfolio of main shareholder of the project. The total value of the investments goes beyond one Bill. Euro (1,164 Bill euro), according to the official website of Tarnita-Lapustesti project[86].

The project is considered to become of vital importance in particular upon the finalization of the third and forth reactors of the Cernavoda power plant while being already regarded as the defining project for Romania's next decade power sector. The necessity of such a project in Romania was imperious, as in general, 25% of hydrological potential of a

[86] http://www.tarnita-lapustesti.ro/

country it is used in such pumped storage schemes, according to Horatiu Liviu Catarag, director of the division Hidrocentrale Cluj[87].

After many studies have been performed throughout the last period, it was established that the best location for the project is the Tarnita-Lapustesti plateau, set on the river Somesul Cald, 30 km upstream from Cluj Napoca, one of the largest cities in Romania in terms of population, in the centre of the country. The reasons for this decision ranged from geographical considerations to economical and efficiency related aspects. From an energetic point of view the location of the pumped hydro station was set between two nuclear power plants Cernavoda, on the south eastern Romanian territory and Paks, in Hungary, thus allowing for the best exploitation of the services the project has to offer. Going beyond the borders, "the location of the project allows also for connection to Central European electricity markets, as well as to south eastern European electricity markets", as according to Hein van Dam, Partner Coordinator for Financial Consultancy of the project on behalf of Deloitte, Balkan region. In regard to the natural landscape, the Lapustesti plateau has meet all the requirements concerning the level difference needed for such a pumped hydro station to function. As can be seen from the picture 8, the Tarnita accumulation represents the lower reservoir in the project, while the upper reservoir will be executed on the Lapustesti plateau, at a level difference of 550 meters. The accumulation lake is conceived for a 10 Mill cubic meters capacity, that occupies a surface of approximately 40 hectares from the Lapustesti plateau.

On the other hand, however, the relative big distance from the concentration zones of wind farms and the localization (as can be seen from figure 9) of the Tarnita- Lapustesti project requires even more stringent improvements in the national power grid system, so that the energy could be transported in a safe and efficient manner to the storage place. (The wind farms locations is described by the red ellipses, while the project location is emphasized by a red square).

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[87] http://www.tarnita-lapustesti.ro/

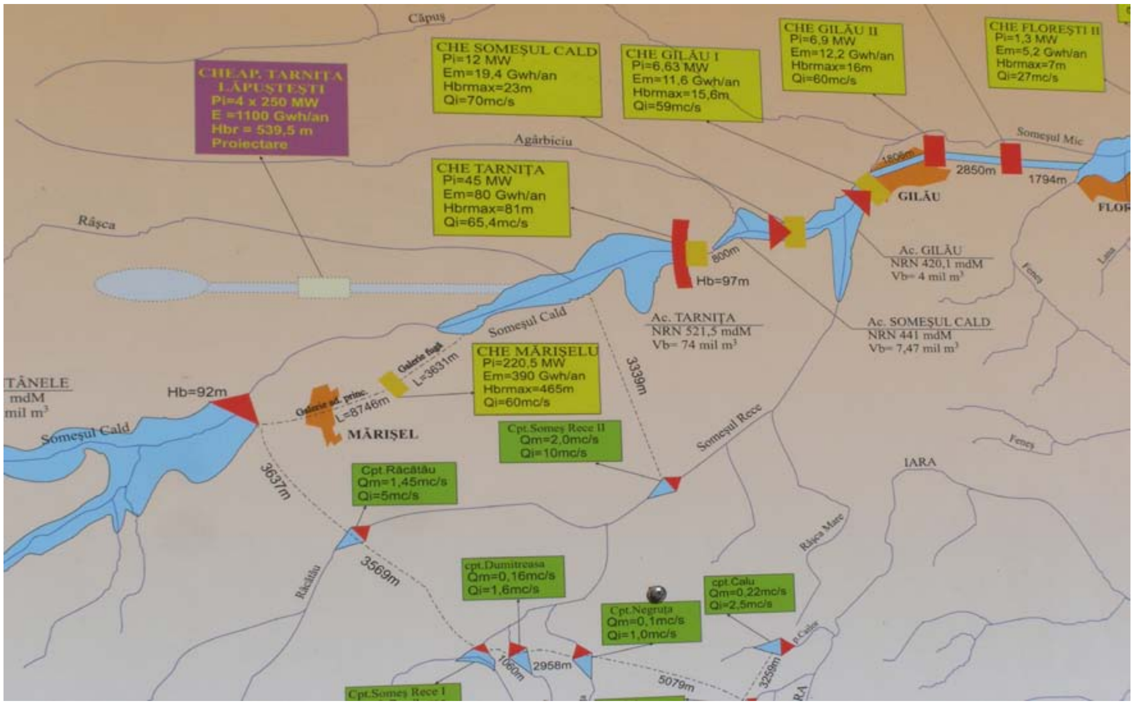

Figure 8 Location of the Tarnita-Lapustesti pumped hydro power plant station

The functioning of the pumped hydro power plant station it is based on the model that during the night the plant accumulates the energy at low load price and it returns the energy back into the system, at peak consumption, during the evening, at a corresponding price. The high technology used in the construction of this project allows for an intervention time of 3-5 minutes from the moment of activation, despite its big proportion and large capacity of 1000 MW. The whole construction will be underground, with two separate caverns, one hosting the pump-turbine equipment and the other dedicated to the grid connection transformers, electric stations, transformers, etc. The power plant will consist of four reversible turbine- pump units, each having a capacity of 250 MW.

Regarding the hydropower parameters, the power plant will have a weekly pumping cycle, with a quantity of energy generated in generator mode of 1,625 GWh/year and a quantity of energy generated in pumping mode of 2,132 GWh/year. The transformation coefficient was calculated at the value of 0.76[88].

[88] Tarnita-Lapustesti project presented on the official website of the Romanian Ministry of Economy: http://www.minind.ro/invest/new/Electric_Energy_Sector/Hidroelectrica/1_Tarnita_Lapustesti_eng.pdf

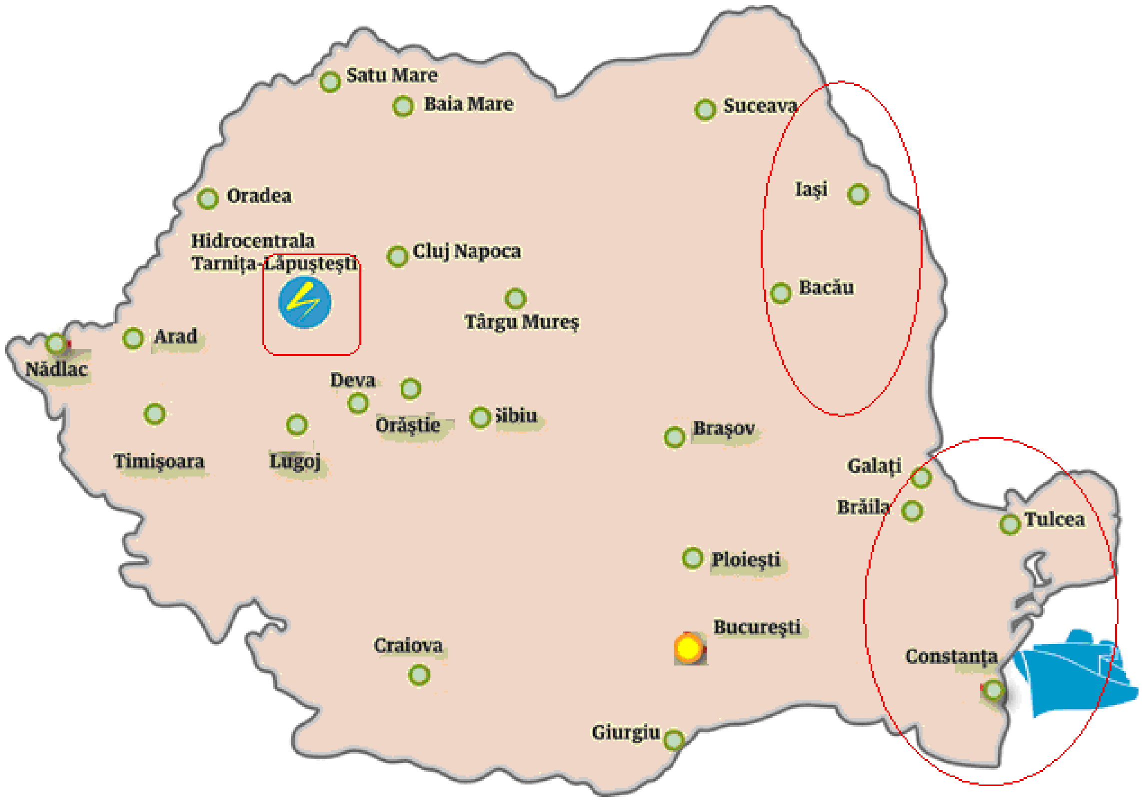

Figure 9 Location Tarnita-Lapustesti, as compared to the wind farms in Dobrogea and Moldova

Tarnita-Lapustesti will play a major role on the local economy as the developers of the project promised not only to employ only Romanian labour force but also to make use of raw materials produced only on Romanian territory. All the auxiliary services are as well to be provided by Romanian citizens. According to the estimations of the developers, not less than 5000 work places are expected to be involved. The construction of the project has not started yet; it is organized in two phases, over 8 years time period, at the moment the developer working on the elaboration of governmental decision proposal for the adoption of the project implementation modalities. Associated with the construction of this project, two new electric power lines are in perspective: Tarnita- Mintia, a 400kV line and Tarnita-Gadalin, as well a 400kV new line. The final commissioning deadline of the project is, at the moment, foreseen for the second quarter of the year 2019 (or beginning of 2020), split in two phases, for 2012-2016 being programmed the commissioning of two units (500 MW) and for 2017-2018 the commissioning of next two units is expected. The complete finalization is even more awaited, as it promises to contribute on a large scale to Romania's transformation into the greatest energetic pole for the South-Eastern Europe.

Despite the fact that Romania will have the privilege to contribute to the global pool of 600 pumped hydro power plant stations through the project Tarnita- Lapustesti, the question still remains unresolved in regard to the storage capacity of wind energy. The Romanian market of wind energy exploded already in the middle of 2010, and considering the forecasts, as well as the increased interest of the biggest companies of the field in the Romanian wind potential, such a plant would be strongly desired much before 2020. The energy produced in a not reliable, dependable or consistent manner will still pose serious problems to the national power grid system and will continue to be not exploited at its highest potential due to, at the moment, lack of solutions.

5. Conclusions

There is no doubt that Romania has a high wind potential that can play a very important role in the future, in regard not only to achieving the targets set at European level, but also in developing the country up to the level where it can become, as some said, the most important energetic pole for the South- Eastern Europe, if all the energy sources are considered and upon final commissioning of the nuclear power plant reactors 3 and 4 from Cernavoda. Localized in one of the best wind corridors in Europe and considering also the potential offshore wind source, Romania enjoys the privilege of having both primary energy sources, although less exploited than in the past and renewable energy sources, in particular biomass, hydropower, wind energy (recently) and nuclear energy.

Although the natural conditions offer the best framework for development in the field of RES, concerns, including my personal opinion, relate to the inability of the country to take advantage of the potential it has. The recent and rapid expansion taking place in the sector of wind energy comes on a still unstable legislative and economic framework that might have later repercussions. The lack of experience in this area and the rushed adopted legislation may cause fissures in the over-night developed system, as it was the case for other flourishing activities in the Romanian society (e.g. real estate).

After having discussed several aspects related to wind energy, ranging from legislation, economy or storage capacities, some conclusions could be drawn, underlining again that the personal opinion of the author is included;

In the field of applied legislation, Romania has done real progress in complying with the EU legislation and transposed the EIA Directive and Methodology into national law; however, more important than that, seems to be the compliance with the national legislation and the new regulations that have to be implemented. As presented earlier in the paper, Romania already had problems with the non-compliance of the EIA Directive for certain projects and this should be definitely avoided in the future.

The above mentioned impacts and developments of wind energy on the overall energy price is hardly assessable in the light of the latest changes appeared in the Romanian energetic system. The discussions on the liberalization of the energy and natural gas prices, and the pressure coming from the international community make the prognoses less certain, as the question would then be whether the prices have increased as a consequence of the RES integrated in the system or due to the price liberalization. On the other hand, there are studies that have been made and that attest that wind energy, as any other type of RES, will increase the overall electrical energy price, due to the high investments done, to the fact that for the primary sources of energy the externalities have not been considered, making them less expensive and due to alternations in the national power grid that have to be somehow balanced.

In regard to the storage capacity, there is one project developing in Romania, the one in Tarnita-Lapustesti; the late deadline finalization, programmed for the year 2019, generates some concerns in regard to the integration of the increased wind energy volume delivered to the system, up to the year 2019. Lacking a viable alternative to the pumped hydro power station until its completion, and bearing in mind the problems of an old power grid system, the wind energy might be drawn back in the near future by an energetic system that is not yet developed enough to face a larger share of RES.

Under the given circumstances, one can conclude in an optimist tone, hoping that wind energy would become a success story of the Romanian energetic market, that will continue to attract investments, at least at the level of 2010, 2011, and that exploited within a solid energetic strategy it will manage to bring Romania on the map of the biggest wind energy producers in Europe. The natural conditions, the wind corridor and the location in which it can be exploited, provide for very good premises of making Romania a green energy market.

Bibliography

- Academia Romana (2002).*'Politica Energetica in Perspectiva Aderarii la UE'*. 1st edition .Bucuresti: Sectia de Stiinte Economice, Juridice si Sociologie a Academiei Romane.
- ANRE (2009).*'Raport privind monitorizarea sistemului de promovare a E-SRE in anul 2009'*. 2009 Edition .Bucuresti: ANRE. 25
- Badileanu M., Bulearca M., Muscalu M.S., Barbulescu C., Ragalie S,. Russu C., Dan V., Fistung D., Hornianschi N., Vania M (2009).*'Modalitati de aplicare in Romania a masurilor prevazute de Directive 32/2006/EC cu privire la utilizatorii finali de energie si servicii energetice.* Vol 363-364-365-366 .Bucuresti: Centrul de Informare si Documentare Economica . 7-130
- Badileanu M., Bulearca M., Muscalu M.S., Neagu C., Ragalie S., Russu C., Sima C. (2009).*'Potentialul de resurse regenerabile pe plan mondial si din Romania. Posibiliatati de valorificare a unor resurse energetice regenerabile'* . Vol 360-361-362 .Bucuresti: Centrul de Informare si Documentare Economica . 5-126
- Badileanu M., Bulearca M., Muscalu M.S., Neagu C., Ragalie S., Russu C., Sima C (2009).*'Impactul cresterii preturilor energiei ca efect al utilizarii resurselor regenerabile de energie.* Vol 351-352-353 .Bucuresti: Centrul de Informare si Documentare Economica . 5-77
- Badileanu M., Bulearca M., Muscalu M.S., Neagu C., Ragalie S., Russu C., Sima C (2009).*'Utilizarea resurselor regenerabile la nivelul Uniunii Europene si al Romaniei'*. Vol. 300-301-302 .Bucuresti: Centrul de Informare si Documentare Economica . 1-25
- Books LLC (2010).*Future Wind Farms in Romania*. - .Tennessee, USA: Books LLC. 1-71
- Books LLC (2010).*Renewable Energy in Romania*. - .Tennessee, USA: Books LLC. 1-15
- Bosselman F., Rossi J., Weaver J.L. (2000).*'Energy, Economics and the Environment'*. University Casebook series .New York: Foundation Press. –
- Chiuta I., Chiuta A., Radu C., Radu C. (2000).'Pagini Web in domeniul energiei'. 1st edition .Bucuresti: Editura ICPE. –
- CRES - Centre for Renewable Energy Sources (2002).*'Assessment of the Technical & Economical Potential of Wind Energy along the Black Sea Coast of Bulgaria & Romania'*. 1st edition .Attiki, Greece: CRES, European Commission, National Governments of Romania and Bulgaria. 24
- Diaconu C., Oprea S.V., Preotescu D. (2008).*'Caracteristicele SEN in contextul integrarii centralelor eoliene'*. ENERGETCA. Nr 11(Part 1), 448-453.
- Dubau C.G. (2007).*'Utilizarea microagregaterlor eoliene in componenta unor sisteme complexe'*. Seria 9, Inginerie Mecanica nr 6 .Bucuresti: Editura Politechnica. 8-10, 30-33
- Dumitrescu H., Cardos V., Dumitrache Al. (2001).*'Aerodynamics of wind turbines'*. 1st edition .Bucuresti: Editura Academiei Romane. –
- European Commission (2001).*'Guidance on EIA -EIS Review'*. Final Report .Luxembourg: Office for Official Publications of the European Communities. 222
- European Commission (2001).*'Guidance on EIA -Scoping'*. Final Report .Luxembourg: Office for Official Publications of the European Communities. 38
- European Commission (2001).*'Guidance on EIA -Screening'*. Final Report .Luxembourg: Office for Official Publications of the European Communities. 38
- European Commission, DG Environment (2009).*'Study concerning the report on the application and effectiveness of the EIA Directive'*. Final Report .Kongens Lyngby, Denmark: European Commission, DG Environment. 222
- Freeman S.D. (1974).*'Energy: The new era'*. 1st edition .USA: Walker & Company . 386
- Groza C., Ivan R., Ignat A. (2010).*'Renewable Energy Sources - Great Expectations and Potential for Romania'*. Buletinul ISPE. Anul 53(Nr. 2/2010), 17-43.
- Guvernul Romaniei (2005).*'Ordonanta de urgenta nr 195/ 22 decembrie 2005 privind protectia mediului'*. nr. 1196 din 30 decembrie 2005 .Bucuresti: Monitorul Oficial. 45
- Guvernul Romaniei (2009).*'Hotarare nr. 445 din 08/04/2009 (Hotarare 445/2009) privind evaluarea impactului anumitor proiecte publice si private asupra mediului'*. 481 din 13/07/2009 .Bucuresti: Monitorul Oficial . 16

- Guvernul Romaniei (2010).*'Ordin privind aprobarea Metodologiei de aplicare a evaluarii impactului asupra mediului pentru proiectele publice si private'*. Partea I, nr 274/27.IV.2010 .Bucuresti: Monitorul Oficial. 32
- Ilie V., Almasi L., Borzasi D., Lunca Gh., Marke G. (1984).*'Utilizarea Energiei Vantului'*. 1st Edition .Bucuresti: Editura Technica. –
- International Energy Agency, IEA. (2010).*'Key World Energy Statistics'*. 1st Edition .Paris, France: IEA. 82
- International Energy Agency, IEA. (2010).*'World Energy Outlook 2010'*. 2010 Edition .Paris, France: IEA. 738
- Klees R. Capcelea A., Barannik A. (2002).*'Environmental Impact Assessment Systems in Europe and Central Asia- The World Bank"*. - .Online Edition: World Bank. (www.worldbank.org/eca/environment.)
- Leca A., Gurau M., Lefter I.S. (2007).*'EMERG: energie, mediu, economie, resurse, globalizare'*. Vol. 4,5 .Bucuresti: Agir. 1-25
- Leca A., Musatescu V., Paraschiv D.M., Voicu-Dorobantu R., Marinoiu A.M. (2009).*'The impact of the implementation of the Energy-Climate change package on the Romanian system'*. 5th Volume .Bucuresti: European Institute of Romania. 7-171
- Lucian V. (2006).*'Resurse si Instalatii de Producere a Energiei Electrice'*. 1st edition .Bucuresti: Editura Agir. –
- Marinescu D. (2010).*'Tratat de Dreptul Mediului'*. 4th edition .Bucuresti: Universul Juridic. 406-456
- Ministerul Mediului (2010).*'Planul National de Actiune in Domeniul Energiei din Surse Regenerabile (PNAER)'*. 2010 Edition .Bucuresti: Ministerul Mediului. 206
- Munteanu C.S. (2007).*'Assessing the potential of wind power in Romania within the Kyoto targets'*. Vol.6, No.3, 219-224 .Iasi, Romania: “Gh. Asachi” Technical University of Iasi, Romania. –
- Neagu V., Parvu C. (2008).*'Aspecte privind racordarea centralelor eoliene la retelele electrice de interes public'*. ENERGETCA. Nr 11(Part 1), 483-486.
- Othman M.B. (1990).*'Optimizarea energetica a centralelor hidroelectrice cu acumulare prin pompare'*. 1st edition .Bucuresti: Institutul Politechnic Bucuresti. –
- Parlamentul Romaniei (2008).*'Lege pentru stabilirea sistemului de promovare a producerii energiei din surse regenerabile de energie 220/2008'*. - .Bucuresti: Parlamentul Romaniei. 18
- Parlamentul Romaniei (2010).*'Lege pentru modificare si completarea Legii 220/2008 pentru stabilirea sistemului de promovare a producerii energiei din surse regenrabile de energiei 139/2010'*. - .Bucuresti: Parlamentul Romaniei. 26
- Parlamentul Romaniei (2006).*'Lege nr. 265 din 29 iunie 2006 pentru aprobarea Ordonantei de urgenta a Guvernului nr. 195/2005 privind protectia mediului'*. nr. 586 din 6 iulie 2006 .Bucuresti: Monitorul Oficial. 7
- Popescu A., Albert H., Serban C (2008).*'Incadrarea productiei CEE in curba de sarcina a SEN. Situatia actuala si de perspectiva'*. ENERGETCA. Nr 11(Part 1), 439-447.
- Rebelo C., Guerreiro J. (2008).*'Comparing EIA procedures and contents in Kenya, Tanzania, Mozambique and EU '*. - .Lisboa, Portugal : Instituto Ciência Aplicada e Tecnologia . 17
- Rojanschi V., Bran F., Diaconu S., Grigore F. (2004).'Evaluarea Impactului Ecologic si Auditul de Mediu". 1st Edition .Bucuresti: Editura ASE. –
- Sluka L. (2008).*'Frameworks and market specifics related to renewable energy sources utilization in specific CEE countries (Bulgaria, Czech Republic, Romania and Slovakia)*'. MSc Program Renewable Energy in Central & Eastern Europe .Banska Bysctrica: Continuing Education Center, TU Vienna, 186
- Stanciulescu G., Jisa M., Stanciu N. (2008).*'Promovarea energiei electrice din resurse de energie regenerabile. Prezent si perspective'*. ENERGETCA. Nr 11(Part 1), 478-482.
- Stanescu C., Gal S., Pispiris S., Sima E.G. (2008).*'Monitoring, Analysing and Reporting the Power Quality within Power Grid'*. ENERGETCA. Nr 11(Part 1), 459-478.
- Uniunea Europeana - Fondul European pentru Dezvoltare Regionala, Guvernul Romaniei, Ministerul Dezvoltarii Regionale si Tursimului, Agentia pentru Dezvoltare Regionala Centru, Instrumente Structurale 2007-2013. (2010).*'Analiza potentialului energetic eolian la nivelul regiunii centru in perspectiva dezvoltarii economice durabile'*. Martie 2010 .Alba Iulia, Romania: ADR Centru. 38

- Zervos A., Kjaer C. (2009).*'Pure Power Wind Energy targets for 2020 and 2030'*. 2009 update .Brussels, Belgium: IEA. 78

Websites:

- Regional Policy - Inforegio (2009). EIA - The main steps involved. Available:http://ec.europa.eu/regional_policy/sources/docgener/evaluation/evalsed/sourcebooks/method_techniques/conducting_impact_assessments/environmental_impact/main_steps_en.htm. Last Accessed Date: 15.05.2011.
- The European Wind Energy Association (2009, 2008, 2007). '2008: Wind now leads EU power sector', '2007: Wind energy leads EU power installations, but national growth is inconsistent', '2006: European Market for Wind Turbines Grows 23%'. Available:http://www.ewea.org/index.php?id=1665. Last Accessed Date: 03.05.2011.
- Communities and Local Government (2000). 'Environmental Impact Assessment: A guide to procedures'. Available:http://www.communities.gov.uk/publications/planningandbuilding/environmentalimpactassessment. Last Accessed Date: 08.05.2011.
- ecomagazin (2010). 'trainii investesc in Romania in fabrici pentru componente de turbine eoliene'. Available:http://www.ecomagazin.ro/strainii-investesc-in-romania-in-fabrici-pentru-componente-de-turbine-eoliene/. Last Accessed Date: 08.05.2011.
- Lascu M. (2010). 'EUROPULS: Piata de energie electrica din Romania. Premisele liberalizarii pietei de energie'. Available:http://energie.businesslive.ro/europuls-piata-de-energie-electrica-din-romania-premisele-liberalizarii-pietei-de-energie/. Last Accessed Date: 05.05.2011.
- Hidroelectrica (2010). 'CHEAP Tarnita Lapustesti'. Available:http://www.hidroelectrica.ro/Details.aspx?page=110. Last Accessed Date: 10.04.2011.
- Les Mariana Carmen (2010). 'Avantajele construirii hidrocentraleiTarnita-Lapustesti'. Available:http://www.tarnita-lapustesti.ro/impactul-asupra-mediului/. Last Accessed Date: 11.04.2011.
- Gal S.A. (2011). 'Raportul curent conform prevederilor art. 224 din Legea nr. 297/2004 '. Available:http://www.transelectrica.ro/Uploads/RaportariCurente/2011/RAP_CURENT_2011_01_03_opnx.pdf. Last Accessed Date: 11.04.2011.
- (2011). 'Raportari curente, anul trecut'. Available:http://www.transelectrica.ro/2Investitori/ancurentrapcur.php. Last Accessed Date: 12.04.2011.
- Gheorghe F. (2008). 'Comuna Mihai Viteazu intră pe harta energiei eoliene'. Available:http://www.cugetliber.ro/1221858000/articol/26401/comuna-mihai-viteazu-intra-pe-harta-energiei-eoliene/. Last Accessed Date: 12.04.2011.
- Statistici (2010). 'Certificate Verzi emise producatorilor de E-SRE pentru energia produsa in 2010'. Available:http://rwea.ro/wp-content/uploads/2010/11/Emise_lunar_2010.pdf. Last Accessed Date: 10.04.2011.
- Comisia Europeana (2010). 'Mediu: Comisia adresează României avertismentul final în privinţa evaluărilor impactului de mediu'. Available:http://ec.europa.eu/romania/news/evaluarea_impactului_de_mediu_ro.htm. Last Accessed Date: 10.05.2011.
- ANRE (2010). 'Ordin pt. aprobarea tarifului mediu pt. serv. de transport, a tarifului pt. serv. de sistem, a tarifului pt. serv. prestate de operatorul pietei centralizate participantilor la pietele administrate'. Available:http://www.anre.ro/ordin.php?id=927. Last Accessed Date: 02.05.2011.
- Iberdrola (2010). 'IBERDROLA RENOVABLES ACQUIRES THE RIGHTS TO DEVELOP 1,500 MEGAWATTS OF WIND POWER IN THE EAST EUROPEAN COUNTRY'. Available:http://www.iberdrola.es/webibd/corporativa/iberdrola?IDPAG=ENMODULOPRENSA&URLPAG=/gc/prod/en/comunicacion/notasprensa/100419_NP_01_EolicoRumania.html. Last Accessed Date: 15.05.2011.
- Tudorache B. (2009). 'Winds of Profit'. Available:http://www.theinvestor.ro/green-investor/winds-of-profit/. Last Accessed Date: 12.04.2011.

- Comisia Nationala de Prognoza (2011). 'PROIECPENTRU PERIOADA 2011 - 2014 '. Available:http://www.cnp.ro/user/repository/prognoza_primavara_2011.pdf. Last Accessed Date:20.05.2011.
- Petrescu R. (2011). 'Energia eoliana, mit sau realitate?’ Available:http://www.businessmagazin.ro/analize/energie/energia-eoliana-mit-sau-realitate-7977439. Last Accessed Date: 09.04.2011.
- Reiter D. (2011). 'RAMOIL MANAGEMENT, LTD. (OTC: RAMO) Groupe Concorde Developments, Inc. Details 1st Two Projects'. Available:http://www.prnewswire.com/news-releases/ramoil-management-ltd-otcramo--groupe-concorde-developments-inc-details-1st-two-projects-121884858.html. Last Accessed Date: 08.05.2011.
- Consumers Energy (-). 'Ludington Pumped Storage'. Available:http://www.consumersenergy.com/content.aspx?id=1830. Last Accessed Date: 18.05.2011.
- Ministerul Mediului (2009). 'E.H.1.10 TARNITA-LAPUSTESTI PUMP-STORAGE HYDROPOWER PLANT (PSHPP)'. Available:http://www.minind.ro/invest/new/Electric_Energy_Sector/Hidroelectrica/1_Tarnita_Lapustesti_eng.pdf. Last Accessed Date: 18.05.2011.
- Roubanis N., Dahlstrom C., Noizette P. (2010). 'Renewable energy statistic'. Available:http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-SF-10-056/EN/KS-SF-10-056-EN.PDF. Last Accessed Date: 13.05.2011.
- Cimpoeru L., Belciug C., Fiser R. (2010). 'Provocarea energiei verzi'. Available:http://www.green-report.ro/sites/default/files/images/revista/iulie2010/GR_36.pdf. Last Accessed Date: 13.05.2011.
- Popa C., Georgescu S., Leca A. (2011). 'Mai multe turbine eoliene in Romania', 'Energia eoliana creste valoarea facturilor'. Available:http://www.gdfsuez-energy.ro/wp-core/. Last Accessed Date: 13.05.2011.

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Appendix

Annex 1 Technical Connection Approvals as of 26.01.2011[89]

Data:	26.01.2011
Codul culorilor/ Colours code	ATR emise de Technical Connection Approval emitted by:
	Transelectrica
	Enel Dobrogea
	E.ON Moldova
	Electrica Transilvania Nord
	Electrica Transilvania sud
	CEZ
	Electrica Muntenia Nord
	Enel Muntenia
	Enel Banat
	ATR Expirate
	ATR Noi

Denumire investitor/ Investor	**Denumire centrale electrice / Electric Power Plants**	**Judetul /County**	**Putere instalata / Installed Power (MW)**	**U(kV)**	**Staţia de record/ Connection Station**
SC DANEOLICA SRL	Platonesti	Ialomita	136	110	Gura Ialomitei
SC INDEPENDENTA GREEN SRL	Independenta	Galati	82	400	Independenta
SC STRAWBERRY FIELD SRL	Strawberry	Galati	63.55	400	Independenta
SC YELLOWTREE SRL	Yellowtree	Galati	53.3	400	Independenta
SC SCHELA GREEN SRL	Schela Green	Galati	32.8	400	Independenta
SC ENERGIE ECOLOGICA ROGIS SGR SRL	Insuratei	Braila	126	400	Insuratei
SC ENERGOPARK SRL	Izvorul Berheciului	Bacau	56	110	Bacau Sud
FF Wind Energy International SRL	Valea Nucarilor	Tulcea	399	400	Tulcea Vest
SC ProWind WindFarm Ivesti SRL	Ivesti	Vaslui	300	220	Banca
SC SUHURLUI EOLIAN SRL	Suhurlui Eolian	Galati	57	400	Independenta
SC REDIU EOLIAN SRL	Rediu Eolian	Galati	78	400	Independenta

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Denumire investitor/ Investor	**Denumire centrale electrice / Electric Power Plants**	**Judetul /County**	**Putere instalata / Installed Power (MW)**	**U(kV)**	**Staţia de record/ Connection Station**
SC PECHEA EOLIAN SRL	Pechea	Galati	66	400	Independenta
SC ENERGIE VERDE PROIECT STÂLPU SRL	Stalpu	Buzau	27	110	Stalpu
SC Gadfly Energy SRL	Gadfly	Braila	15	110	Lacu Sarat
SC Rusalka Energy SRL	Rusalka	Braila	15	110	Lacu Sarat
SC Morava Wind Energy SRL	Morava	Braila	15	110	Lacu Sarat
SC San Jose Energy SRL	San Jose	Braila	15	110	Lacu Sarat
SC Vladimir Energy SRL	Vladimir	Braila	18	110	Lacu Sarat
SC Eolica Dobrogea SRL	Eolica	Constanta	600	400	Tariverde
SC Galati EOL SUD SRL	Pechea-Rediu	Galati	150	110	Smardan
SC Sorgenia Romania SRL	Falciu 1	Vaslui	88	220	Banca
SC Sorgenia Romania SRL	Falciu 2	Vaslui	18	220	Banca
SC Creative Solutions Project SRL	Naidas	Caras-Severin	110	400	NAIDAS
SC ENERGY SKY SRL	Frecatei	Tulcea	141	110	Isaccea
SC Delta Wind SRL	Delta Wind	Iasi	224	400	Mironeasa
SC Crucea Wind FARM SRL	Crucea Nord	Constanta	108	400	Stupina
SC Crucea Power Park SRL	Crucea Est	Constanta	100	400	Stupina
SC Energo Wind Prod SRL	Vulturu Nord	Constanta	108	400	Stupina
SC Vulturu Power Park SRL	Vulturu Est	Constanta	100	400	Stupina
SC Vulturu Wind Farm SRL	Vulturu Vest	Constanta	108	400	Stupina
SC Saraiu Wind Farm SRL	Saraiu	Constanta	75	400	Stupina
SC AMFION SRL	FRUMUSITA	Galati	150	110	Smardan
SC GALROM CONSTRUCT SRL	ISACCEA	Tulcea	47.5	110	Isaccea
SC CS Wind Projects SRL	Garnic	Caras-Severin	74	110	NAIDAS
SC Wind Farm Promoter SRL	Cornea-Mehadia	Caras-Severin	600	220	Cornea -220kV Mehadia -400kV
SC Real Excont SRL	Sacele	Constanta	102	400	Tariverde
WIND DOBROGEA	Ciocarlia	Constanta	32	110	Basarabi – Cobadin
RENOVATIO POWER	Cobadin 1	Constanta	26	110	Basarabi – Cobadin
EOLIAN CENTER	Isaccea	Tulcea	16	110	TL VEST – ISACCEA
ENERGO INVEST	Platonesti	Ialomita	15	110	GURA IALOMITEI
GENERAL MACHINE BUSINESS DIVISION	Pantelimon	Constanta	4	20	110/20/6 kV Galbiori
PRIMARIA ADAMCLISI	Adamclisi	Constanta	0.2	20	LEA 20 kV 6300
PRIMARIA BARAGANU	Baraganu	Constanta	0.2	20	LEA 20 kV 4203
PRIMARIA CERCHEZU	Cerchezu	Constanta	0.2	20	LEA 20 kV 2403
PRIMARIA COMANA	Comana	Constanta	0.2	20	LEA 20 kV 1701
PRIMARIA CRUCEA	Crucea	Constanta	0.2	20	LEA 20 kV 6502
PRIMARIA DELENI	Deleni	Constanta	0.2	20	LEA 20 kV 6300
PRIMARIA GHINDARESTI	Ghindaresti	Constanta	0.2	20	LEA 20 kV 6504

Denumire investitor/ Investor	Denumire centrale electrice / Electric Power Plants	Judetul /County	Putere instalata / Installed Power (MW)	U(kV)	Staţia de record/ Connection Station
PECINEAGA ENERGIES	Pecineaga	Constanta	60	110	110/20 kV Tataru
SC TOPLET ENERGY SRL, SC SMART TEAM ENERGY SRL, EURO WIND ENERGY SRL	Toplet	Mehedinti	50.4	110	statie proprie 100/20 kV intrare-iesire in LEA 110 KVd.c. Toplet-Dr.Tr.Severin
SC FIORAM COM SRL	Jugureni	Prahova	50	110	Mizil
SC PANEL EOLIAN ENERGY SRL	Scortoasa	Buzau	30	110	Beceni
SC EOLGEN SA	Racoviteni	Buzau	40	110	axul LEA 110 kV Stalpu-CHE Simileasca-Rm. Sarat
SC SOCOMIZO CONSTRUCT SRL	CA Rosetti	Buzau	10	20	Faurei
FUTUREWIND SRL	Beceni	Buzău	30	110	Beceni
BRAILA WINDS SRL	Gemenele	Braila	47.5	110	Romanu
SC EDP RENEWABLES ROMANIA SRL	Tecuci	Galati	30	110	ICM Tecuci
SC GRENERG SRL	Scanteiesti	Galati	1.5	20	Frumusita
SC ENVICONS WIND SRL	Beresti Meria	Galati	30	110	Beresti
SC ELECTRICA SA	Ijdileni-Frumusita	Galati	50	110	SRP 5 Frumusita
SC KELAVENT ALFA SRL	Tecuci	Galati	34	110	Tecuci
E-ON Regenerabile Romania SRL	Falciu Berezeni	Vaslui	30	110	Falciu
E-ON Regenerabile Romania SRL	Rosiesti	Vaslui	46	110	Rosiesti
E-ON Regenerabile Romania SRL	Vetrisoaia	Vaslui	36	110	Vetrisoaia
SC EDP RENEWABLES ROMANIA SRL	Vutcani+Albesti	Vaslui	52	110	Husi - Munteni
SC INFUSION SRL	Sulita	Botosani	65	110	Hudum - Flamanzi-Harlau
SC EOLOLAND SRL	Dingeni, Gorbanesti	Botosani	46,9	110	Trusesti
SC EGNATIA ROM SRL	Balabanesti	Galati	9	20	Crang
SC TELEMONT SRL	Borca	Neamt	49,5	110	Branar-Poiana Teiului
SC MULTIMEDIA ART&TEHNIC SRL	Dranceni,Arsura,Duda-Epureni	Vaslui	67	110	LEA 110 kV, nou proiectata intre statiile Husi si Gorban
SC DUCIPAL ELECTRIC SRL	Siretel, Vanatori	Iasi	9	110	Pascani-Harlau
SC ACK SRL	Sticlaria	Iasi	40	110	Pascani-Harlau
COZMIRCOM BLUE SRL	Sf.Elena	Caras-Severin	48	110	Moldova Noua-Cozla
COMPANIA EOLIANA SRL	Sannicolau Mare	Timis	36	110	110/20 kV Sannicolau Mare
TOPSIDE SERVICES SRL	Poieni – Oravita	Caras-Severin	12.5	110	110/20 kV Oravita
Primaria Caransebes	Caransebes	Caras-Severin	3.234	20	110/20 kV Otelu Rosu
SC BIAL EURO-EXIM S.R.L	Agadici	Caras-Severin	15	110	LEA 110 kV Oravita-Ciudanovita
COMUNA CORNEREVA	Pogara	Caras-Severin	0.00891	0.4	PT 7393
COMUNA SLATINA TIMIS	SADOVA VECHE	Caras-Severin	0.007	0.4	PT 6267
WINDKRAFT SIMONSFELD SRL	Sf.Elena	Caras-Severin	84	110	110/20/6 kV Moldova Noua
SC ROMSTRADE SRL	Adunatii Copaceni	Giurgiu	0.6	20	110/20kV Arcuda
SC SURAKI SRL	Rasuceni	Giurgiu	25	110	statia 110/20 kV Cucuruzu
TOTAL			**5.630**		

Annex 2. Technical Connection Contracts, as of 26.01.2011[90]

Data:	26.01.2011
Codul culorilor	Contracte de racordare incheiate de:
	Transelectrica
	Enel Dobrogea
	E.ON Moldova
	Electrica Transilvania Nord
	Electrica Transilvania Sud
	CEZ
	Enel Banat
	Electrica Muntenia Nord
	Enel Muntenia
	Contracte Expirate
	Contracte de racordare noi

Denumire investitor/ Investor	**Denumire centrale electrice / Electric Power Plants**	**Judetul /County**	**Putere instalata/ Installed Power (MW)**	**U(kV)**	**Staţia de record/ Connection Station**
SC MW TEAM INVEST SRL	Fantanele Est	Constanta	90	400	Tariverde
SC TOMIS TEAM SRL	Fantanele Vest	Constanta	255	400	Tariverde
SC OVIDIU DEVELOPMENT SRL	Cogealac	Constanta	255	400	Tariverde
SC SABLOAL ENERGIE EOLIANA SRL	Valea Dacilor	Constanta	147	110	Medgidia Sud
LAND POWER SRL	Dorobantu-Topolog	Tulcea	168	400	Rahmanu
CAS REGENERABILE SRL	Casimcea, Daeni, Topolog	Tulcea	50	400	Rahmanu
ALFA WIND SRL	Casimcea, Daeni, Topolog	Tulcea	150	400	Rahmanu
BETA WIND SRL	Casimcea, Daeni, Topolog	Tulcea	232	400	Rahmanu
SC Wind Activa Bucuresti SRL	Filipesti	Bacau	60	110	Bacau Sud
SC Wind Activa Development SRL	Saucesti	Bacau	100	110	Bacau Sud
SC ENEL DISTRIBUTIE DOBROGEA SA	Agighiol-Valea Nucarilor	Tulcea	34	110	Tulcea Vest
SC ENEL DISTRIBUTIE DOBROGEA SA	Pestera	Constanta	90	110	Medgidia Sud
SC ELCOMEX EOL SA	Nicolae Balcescu Targusor	Constanta	272	400	Stupina
SC GARDENLAKE NORTH SRL	Serbotesti	Vaslui	240	110	Munteni
SERVOPLANT ECO ENERGIE	Corbu	Constanta	0.09	20	Sitorman
ELECTROGRUP	Valea Nucarilor	Tulcea	0.75	20	Sarinasuf
GREEN ENERGY GRUP	Valea Nucarilor	Tulcea	0.75	20	Sarinasuf
BLUE LINE IMPEX	Valea Nucarilor	Tulcea	0.75	20	Sarinasuf
HOLROM RENEWABLE ENERGY (fosta Pentium SRL)	Baia	Tulcea	2.72	20	Baia

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Denumire investitor/ Investor	Denumire centrale electrice / Electric Power Plants	Judetul /County	Putere instalata/ Installed Power (MW)	U(kV)	Staţia de record/ Connection Station
GREEN ENERGY GRUP	Valea Nucarilor	Tulcea	1.2	20	Sarinasuf
HYDRO WIND POWER	Valea Nucarilor	Tulcea	0.6	20	Sarinasuf
ELECTRO GRUP ENERGY	Valea Nucarilor	Tulcea	1.2	20	Sarinasuf
ELECTRIC PROD	Macin	Tulcea	1.74	20	Macin
ROMWIND INTERNATIONAL	Mihai Viteazu	Constanta	29.9	110	Fantanele
NEG PROIECT 1	Pantelimon	Constanta	1.6	20	Galbiori
ROMWIND	Pantelimon	Constanta	2.4	20	Galbiori
ROMWIND	Ciocarlia	Constanta	4	20	Cobadin
NEG PROIECT 2	Mihai Viteazu	Constanta	2.4	20	Mihai Viteazu
ENERGII ALTERNATIVE	Mihai Viteazu	Constanta	0.8	20	Mihai Viteazu
NEG PROIECT 1	Mihai Viteazu	Constanta	3.2	20	Mihai Viteazu
ENERGII ALTERNATIVE	Biruinta	Constanta	2.4	20	Eforie Nord
BLUE LINE ENERGY	Valea Nucarilor	Tulcea	1.7	20	Sarinasuf
EVIVA ENERGY	Babadag 2	Tulcea	8.4	20	Babadag
ELECTRICOM	Casimcea	Tulcea	10	20	Cismeaua Noua
INTERTRANS KARLA	Casimcea	Tulcea	5.8	20	Cismeaua Noua
SC E.K.W. ENERGY SRL	Fagarasu Nou	Tulcea	6.69	20	Ostrov
DINAMIC AGRO 99	Fagarasu Nou (Magurele)	Tulcea	10	20	Ostrov
LIGHT ENERGY	Nalbant	Tulcea	0.6	20	Zebil
EOL POWER COMPANY	Murighiol	Tulcea	7.5	20	Sarinasuf
ECO POWER WIND	Mireasa	Constanta	10	20	Galbiori
CHIMCONSULT	Fagarasu Nou	Tulcea	3	20	Topolog
WIND STARS	Silistea	Constanta	5	20	Mircea Voda
HOLROM RENEWABLE ENERGY	Baia	Tulcea	5	20	Baia
BLUE ENERGY	Corugea-Cismeaua Noua	Tulcea	70	110	Cismeaua Noua
BLUE LINE VALEA NUCARILOR	Agighiol-Valea Nucarilor	Tulcea	70	110	Tulcea Est- Tulcea Oras
ENEL GREEN POWER ROMANIA	Agighiol-Valea Nucarilor	Tulcea	70	110	Tulcea Vest - Tulcea Est
BLUE LINE ENERGY	Agighiol-Valea Nucarilor	Tulcea	35	110	Tulcea Vest - Sarinasuf
WIND POWER PARK	Dorobantu	Constanta	45	110	Harsova - Medgidia Nord
RENOVATIO POWER	Sarichioi	Tulcea	33	110	Tulcea Vest – Zebil
LAND POWER SRL	Cerna	Tulcea	72	110	Macin – Traian
EVIVA NALBANT	Babadag 1	Tulcea	33.6	110	Babadag
HOLROM RENEWABLE ENERGY	Baia 3	Tulcea	10	20	Baia
TOTAL ELECTRIC	Topolog	Tulcea	15	110	Topolog
TOTAL NATURAL	Corbu	Constanta	0.6	20	Sitorman

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EOL ENERGY MOLDOVA	Mahmudia	Tulcea	5	20	Sarinasuf
WIND PARK INVEST	Pecineaga 2	Constanta	6	20	Tataru
EDP RENEWABLES (fost RENOVATIO POWER)	Pestera	Constanta	90	110	Medgidia Sud –Rasova
TILCOF	Casimcea	Tulcea	10	20	Cismeaua Noua
ELEKTRA INVEST	Tortomanu 1 (Mircea Voda)	Constanta	6	20	Mircea Voda
ELEKTRA INVEST	Tortomanu 2 (Mircea Voda)	Constanta	8	20	Mircea Voda
EWIND	Pantelimonu(Crucea)	Constanta	150	110	Basarabi - G. Ialomitei
BLUE PLANET INVESTMENTS	Baia	Tulcea	35	110	Baia
CERNAVODA POWER	Cernavoda 1	Constanta	69	110	Mircea Voda-Medg.N.
CERNAVODA POWER	Cernavoda 2	Constanta	69	110	Tortomanu
BLUE LINE ENERGY	Caierac	Tulcea	6.9	20	Sarinasuf
MIREASA ENERGIES	Targusor(MIREASA)	Constanta	50	110	Nicolae Balcescu - Galbiori
FAST WIND ENERGY	Fagarasu Nou	Tulcea	8	20	Ostrov
LIGHT ENERGY	Nalbant	Tulcea	2.4	20	Zebil
ROMCONSTRUCT TOP	Silistea	Constanta	25	110	Harsova - Medgidia Nord
MONSSON ALMA	Galbiori	Constanta	5	20	Harsova
ELECTRA WIND POWER	Tortomanu	Constanta	8	20	Nicolae Balcescu
ROMWIND com. Beidaud	Sarighiol de Deal	Tulcea	8	20	Baia
EOLIAN PROIECT	Pantelimon	Constanta	4.8	20	Galbiori
WIND POWER	Limanu	Constanta	10	20	SN Mangalia
GENERAL CONCRETE	Nicolae Balcescu	Constanta	28	110	Nicolae Balcescu
ECOPROD ENERGY	Topolog	Tulcea	9.21	20	Topolog
ECOENERGIA	Stejaru	Tulcea	34	110	Mihai Viteazu – Zebil
SABLOAL ENERGIE EOLIANA	Pestera	Constanta	204	110	Basarabi
EOLICA DOBROGEA ONE	Mihai Viteazu	Constanta	80	110	Mihai Viteazu
ALPHA ENERGY	Jurilovca	Tulcea	4	20	6 Martie
ISOCONSULT	Pecineaga 1	Constanta	4	20	Neptun
ISOCONSULT	Pecineaga 3	Constanta	4	20	Tataru
GROUND INVESTMENT CORP	Babadag 3	Tulcea	31.5	110	Babadag
DANIA DEVELOPMENT	Nistoresti	Constanta	9	20	Siriu
EAST DATA	Deleni	Constanta	8	20	Cobadin
VETERAN POWER	Piatra	Constanta	8	20	Sitorman
ELEKTRA POWER	Cernavoda	Constanta	10	20	Cernavoda
RIG SERVICE	Horia	Constanta	7.5	20	Siriu
EURINVEST ENERGY	Deleni	Constanta	9	20	Cobadin
ENERGIA VERDE VENTUNO	Cerna	Tulcea	17.5	110	Traianu

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EP WIND PROJECT (ROM) SIX	Chirnogeni	Constanta	76	110	Chirnogeni
EXTRAPOWER	Cobadin	Constanta	50	110	Cobadin
PECINEAGA ENERGIES	Pecineaga	Constanta	50	110	Tataru
WIND POWER	Limanu	Constanta	48	110	SN Mangalia
ENEX	Nalbant	Tulcea	27.5	110	Zebil-Tulcea Vest
RAGGIO VERDE	Tichilesti (Horia)	Constanta	27.5	110	Harsova – Topalu
ATRA ECO	Pecineaga 4	Constanta	24	110	Neptun – Costinesti
C-TECH	Mihai Viteazu	Constanta	6	20	Mihai Viteazu
RIG SERVICE	Saraiu	Constanta	32.5	110	Harsova si Siriu
VENTUREAL LIMA	Baneasa	Constanta	10	20	Baneasa
ELECTRICOM	Casimcea 2	Tulcea	10	20	Cismeaua Noua
SUN MEDIA	Tulcea	Tulcea	10	20	Tulcea Vest
ENEL GREEN POWER ROMANIA	Agighiol-Valea Nucarilor	Tulcea	34	110	Tulcea Vest – Sarinasuf
VAN PRO ENERGY	Greci	Tulcea	72.5	110	Lacu Sarat – Ostrov
IMOBIS	Albesti	Constanta	40	110	Tataru - Neptun
ECO POWER WIND	Pecineaga	Constanta	5	20	Neptun
ROMCONSTRUCT TOP	Vulturu	Constanta	5	20	Siriu
DELTALACT TULCEA	Lastuni	Tulcea	7.5	20	Tulcea Vest
HOLROM	Sacele	Constanta	7.5	20	Sitorman
PROMT ENERGY	Dealu Redi	Tulcea	5	20	Tulcea Vest
AGROINDUSTRIALA CONSUL NALBANT	Nalbant	Tulcea	7.5	20	Tulcea Vest
GAMALEX IMPEX	Satu Nou	Tulcea	8	20	Zebil
SC PALACE CONSTRUCT SRL Campina	Com. Foltesti	Galati	9.8	20	Foltesti
SC PALACE CONSTRUCT SRL Campina	Com. Foltesti	Galati	10	20	Foltesti
EUROPP ENERGOCONS	Frumusita	Galati	33	20	Frumusita
SC CORNI EOLIAN SRL	Corni	Galati	70	110	Cudalbi – Liesti
SC CUSTOM LINE Energy SRL	Com. Varlezi Com. Corni	Galati	10	20	Cudalbi
SC CUSTOM LINE Energy SRL	Com. Varlezi	Galati	6	20	Bujoru
SC Bridgeconstruct SRL Iasi	Com. Cudalbi	Galati	10	20	Cudalbi
SC M&M 2008 SRL PLOIESTI	com. Topliceni	Buzau	10	20	Costieni
SC PANEL INTERNATIONAL SRL PLOIESTI	Com. Calugareni	Prahova	10	20	Mizil
SC GAMISA ENERGY SRL	Vanatori	Galati	10	20	SRP 1 Vanatori
SC ODIS SRL, sat Urleta, com. Banesti, jud. Prahova	Vanatori	Galati	10	20	SRP 1 Vanatori
SC ALWIND ELECTRIC SRL	Vanatori	Galati	10	20	SRP 1 Vanatori
SC MONEY INVEST SRL, Campina, jud. Prahova	Vanatori	Galati	10	20	SRP 1 Vanatori

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SC BIXENTA IMPEX SRL	Vanatori	Galati	10	20	SRP 1 Vanatori
SC AMMONIT ENERGY SRL	Vanatori	Galati	10	20	SRP 1 Vanatori
SC Palace Construct SRL	Vanatori	Galati	10	20	SRP 1 Vanatori
SC BIGSEM CONSTRUCT SRL	Urleasca	Braila	10	20	Urleasca
SC LOSPA SRL	Urleasca	Braila	10	20	Urleasca
SC DOMCO ENERGY SRL	Urleasca	Braila	10	20	Urleasca
SC REIFAG ELECTRIC SRL	Urleasca	Braila	10	20	Urleasca
SC GREEN ENERGY FARM SRL SRL	Cuza Voda	Braila	6	20	Cuza Voda
SC DAN Holding MGM SRL	Pechea	Galati	6	20	Pechea
SC Smart Clean Power SRL	Schela	Galati	8	20	Schela
SC Smart Clean Power SRL	Ianca	Braila	8	20	Ianca
SC A-Z Market Construction SRL	Bordei Verde	Braila	8	20	Bordei Verde
SC SOFT GROUP SRL	Insuratei	Braila	10	20	Insuratei
SC TRIOENERGY SRL	Podgoria	Buzau	45	110	Costieni – Gugesti
SC GRENERG SRL Satu Mare	Scanteiesti	Galati	1	20	Frumusita
SC ROMSTAL IMEX SRL, Bucuresti	Sat Costi	Galati	0.23	20	Vanatori
SC EOL Energy Moldova SRL Satu Mare	Varlezi	Galati	6	20	Bujoru
SC EOL Energy Moldova SRL Satu Mare	Smulti	Galati	2	20	Bujoru
SC EOL TURBINES SRL	Viisoara	Vrancea	10	20	Vidra
SC ANEMO ENERGY SRL	Costis	Vrancea	10	20	Adjud
SC ENERGIE ELECTRICA ROGIS SRL	Insuratei	Braila	60	110	Insuratei
SC SMARTBREEZE SRL	Apollo Frumusita	Galati	9	20	Vanatori
SC TODAY POWER SRL	Branistea	Galati	2	20	Schela
SC FUTURE POWER SRL	Pechea	Galati	2	20	Pechea
SC FIORAM COM SRL	Jugureni-Parc Eolian 1	Prahova	10	20	Mizil
SC FIORAM COM SRL	Jugureni-Parc Eolian 2	Prahova	10	20	Mizil
SC KELAVENT GOLF SRL	Victoria	Braila	8	20	Baraganu
SC KELAVENT ECHO SRL	Luciu-Pogoanele	Buzau	8	20	Pogoanele
SC KELAVENT CHARLIE SRL	Dudesti	Braila	8	20	Dudesti
SC ECOENERG SG ROGIS SRL	Surdila Găiseanca	Brăila	28	110	Făurei
SC VICTOLOGIC ENERGIE SRL	Salcia Tudor	Brăila	50	110	Măxineni
PIROTEHNIC O.S.B. SRL	Muntenii de Jos	Vaslui	0.23	20	Bacauani – Munteni
GERVIS SA	Bucecea	Botosani	0.03	20	Bucecea – Hudum
SC TELESATELIT SRL	Sat Dienet Deal	Bacau	0.23	20	Racaciuni
SC ENERGYCUM W SRL	Ruginesti	Vrancea	1.2	20	Caiut – Siscani
SC BTWM CANDESTI SRL	Candesti	Botosani	0.9	20	Mihaileni – Siret

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SC EOL ENERGY SRL	Berezlogi	Iasi	1,6	20	Siretel
SC ENERGOWIND RO SRL	Negresti	Vaslui	64	110	Munteni – Negresti
SC GEO DATA SRL	Emil Racovita	Vaslui	4	20	Negresti-Vaslui
SC WINDAIR SRL	LIPOVAT II	Vaslui	2	20	Rosiesti- Irigatii Sarbi
SC ELECTRICA SERV SRL	Ghermanesti, Dranceni	Vaslui	10	20	Gorban
PROVIDER GREEN	Moldova Noua	Caras-Severin	50	110	110/20/6 kV Moldova Noua
PROVIDER GREEN	Moldova Noua	Caras-Severin	30	110	110/20/6 kV Moldova Noua
LC BUSINESS SRL	Oravita –Poieni	Caras-Severin	9	20	110/20 kV Oravita
COMPANIA EOLIANA SRL	Vrani	Caras-Severin	100	110	Oravita - Moldova Noua
COMPANIA EOLIANA SRL	Jimbolia	Timis	60	110	110/20 kV Jimbolia
CONSTRUCTIM IMOBILIARE SRL	Oravita	Caras-Severin	2.5	20	110/20 kV Oravita
Ion Floian Danut	Balotesti	Ilfov	0.005		PTA 7381 Balotesti – Caciulati
TOTAL			**5.271,825**		