ROMANIA'S ENERGY RESOURCE MANAGEMENT IN THE PERSPECTIVE OF 2020

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ABSTRACT

EU policy regarding energy for the period of time until 2020 requires Romania to review its energy resource management. The Romanian energy market, as part of the Community energy market, has to firstly be a nationally competitive market and then comply to European standards; a market in which the eligible consumers' weight should prevail and the majority of production, distribution and supply activities should be developed within the private sector.

The papers have identified the traditional sources for obtaining wind energy, within the parameters of economic efficiency and pollution specified by the EU's policies, and whose capitalization should reach the performance standards required by the EU, as well as the weight perspective of non-conventional energy.

KEY WORDS: *economics, strategic resources, management, geopolitics.*

JEL CLASSIFICATION: M10, M11, N7, O13

1. INTRODUCTION

In order to establish realistic strategies regarding the energetic future of the country, an evaluation of energetic resources was made through the reserves-production relation, from which the time that must be taken into consideration for their consumption must result. (Zamfir, Andreea (2005) "*Dezvoltarea sectorului energetic din România – obiectiv principal al strategiei de dezvoltare durabilă orizont 2025*", Economia seria Management, 8 (1)). The complex problem of energy strategies is up for debate among specialists in various fields: electrical energy, geology, economy, geography, extraction etc., being at the same time a part of the EU's perspective plans for energy safety. The energy sector efficiency and the ways through which new competitive markets in the field can be created were illustrated through specific methods. The study of the Romanian natural gas markets was also taken into consideration, a market with a high degree of concentration but with big liberalization opportunities (Spiridon, 2013), "*Rezerva de gaze naturale a României*" in the supplement RESURSE NATURALE – GAZE published with the printed version of the magazine Capital issue 47). Renewable resources, mainly eolian and geothermal (the Geoexchange system), have been analyzed from the standpoint of costs and benefits, of selecting the area with the maximum output.

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2. EVOLUTION OF CAPACITIES IN THE ENERGY SECTOR

EU energy programs allow each country to freely set its necessary mix of energy, depending on each one's distinctiveness. Romania signs up as one of the first historical producers of electrical energy on a larg scale. In Romania, the first thermal plant started working, alongside others in the world, at Bucharest (1882), followed by the ones in Timişoara (1884) and Caransebeş (1887). The first hydro-electric power plants were built on the river Sadu (1886 – the third one in Europe age-wise) and Prahova (Sinaia, 1889).

Nowadays, thermal plants exist in any geographical region of the country. A third of the capacity installed in them is of those placed between the Carpathians and the Danube, between the Sub-Carpathians and the Getic Defile: Turceni, Rogojelu, Işalnița, Râmnicu Vâlcea. Energetic coals from the Petroşani are used in plants at Paroşeni and Mintia (Deva): important thermo-energetic capacities are working in the Subcarpathians of Ialomița, but also at Borzeşti, Oradea, Galați, Aghireşu. Very important are also the capacities placed in petroliferous and gaseous areas: Brazi, Sângeorgiu de Pădure şi Iernut.

In areas deprived of energy sources, but big consumers of electricity, the thermal plants at Chişcani – Brăila, Palas – Constanța, Iaşi, Suceva, Timişoara, Arad, Oradea, Satu-Mare etc. were set up, as well as in Bucharest (Sud, Vest, Grozăveşti, Progresu).

In 1966, the first group of the nuclear power plant at Cernavodă became functional, and the second one in 2007. The costs of materializing and implementing nuclear unit nr. 2 in 2007 were: costs with radioactive waste disposal; costs with assuring the nuclear security protection and reactor maintenance – in order to prevent accidents; the cost of "heavy water" (up to 20% of capital costs of a CANDU unit are due to the big stock of heavy water); costs with the equipment fabrication for nuclear electric plants (FCNE) and implementation costs of quality management.

According to the Department for Energy, the strategy to be applied in 2014 for units 3 and 4 at Cernavoda is:

a. The project society's possibility to contract electric energy before obtaining a producer's licence, both on the OPCOM platform and off it;
b. Developing a CfD mechanism (contracts for difference), a model used during the market reformation process in Great Britain, which emphasizes investments in the energy field in production capabilities with a reduced carbon dioxide emission.(Strategia energetică a României pentru perioada 2007-2020 actualizată pentru perioada 2011-2020).

On September the 23rd, the China Nuclear Power Corporation made an offer for the finalization of reactors 3 and 4 at Cernavoda that will be analyzed by the governmental commission in the following period of time.

The hydroenergetic management of rivers comprises important capacities, that in hydroelectric plants value almost 50% of the potential of rivers. Some of the most important hydroenergetic plants are those on the Danube, Bistrița, Argeş, Olt, Someşul Cald, Sebeş, Siret, Ialomița, Lotru, Prut.

SEN activity in 2013 was characterized by **the decrease in internal consumption of electrical energy**, mixed with the **continual growth of the weight of power installed in plants working with renewable energy sources**, in the conditions of a hydrologically normal year (Autoritatea Națională de Reglementare în domeniul Energiei (National Authority for Regulations in the field of Energy, *Annual report*, 2013).

Table 1. Structure types of energy resources (2012)

Nuclear	19,6%
Wind	5,3%
Other resouces	0,4%
Coal	37,6%
Oils	0,6%
Natural gas	14,3%
Hydroenergy	22,2%

Source: INS, 2013

In the structure of energy resources capitalized upon in order to produce electric energy, Romania still uses mineral fuels (coals, oil, natural gases), plus hydro- and nuclear energy, while renewable sources (solar, wind, geothermal) are still used on a more limited scale, but one that has registered significant growth since 2010 (Cojocaru, 2013), "*România, a 5-a putere europeană în materie de energie eoliană*", Income Magazine.).

In the case of a structure based on primary resources (coal, oil, natural gases) from the internal production, one can see from the following table that, regarding resources used mainly for producing electric power (coals, natural gases), independence is over 80% assured regarding what consists of a relatively consolidated position with respects to certain variables:

1. the oscillationof the flux of imported important resources (in the case of supplies of natural gases from Russia, which sustained losses compared to the ammount contracted);
2. the context of crises on the international market;
3. geopolitical tensions.

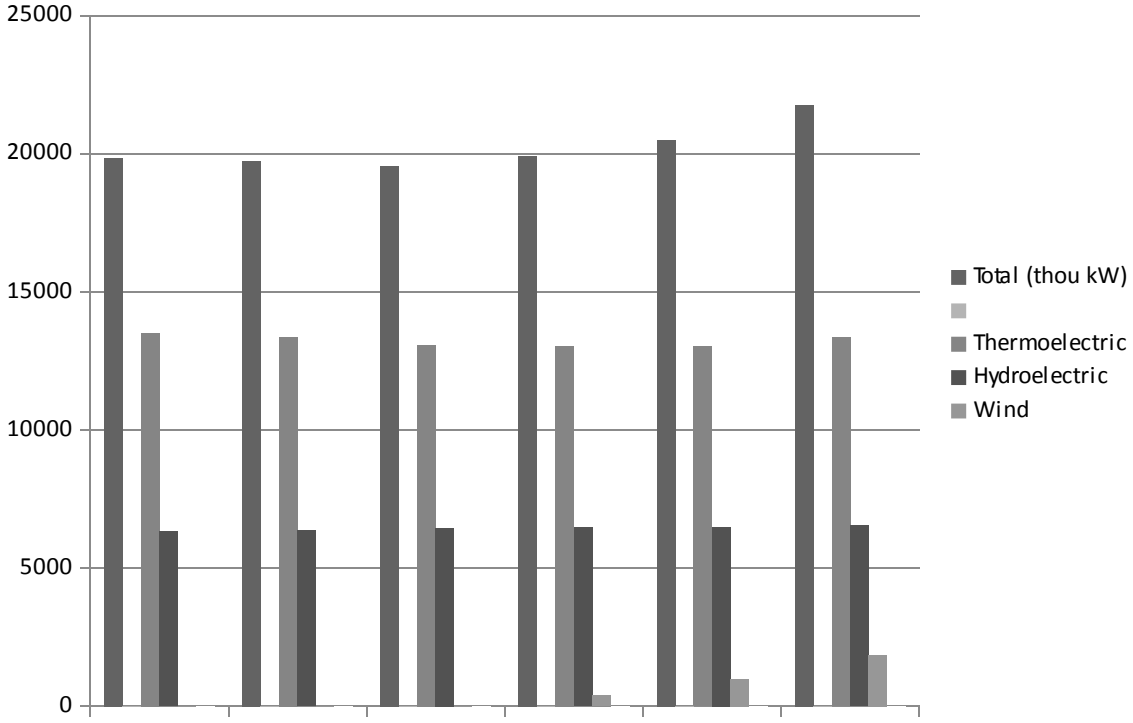
Table 2. Energy independence degree (in percentage)

Year	**2010**	**2011**	**2012**
Coal	85,4	81,8	84,0
Oil	41,5	42,8	43,9
Natural Gas	79,9	78,0	80,3
Total	**78,8**	**77,0**	**77,7**

Source: INS, 2013

In 2012, the electrical energy production was 59,047 kWh. Regarding the origin of the electrical energy, most of it was produced in thermal plants utilizing hydrocarbons and coal (44.062 billion kWh); production in hydroelectric plants was equal to 12.337 billion kWh and that of nuclear resources – 11.618 billion kWh. Production in eolian power plants is equal to 4.696 billion kWh.

Figure 1.



Source: INS, 2013

3. MINERAL FUELS

In elaborating any energetical strategy, one must start with what is specific to our country: a diversified range of energy resources that are small in quantity.

Romania possesses every category of coal, but its reserves are small, estimated at approximately 500 billion tons; the dominant ones are lower coals, approximately 90%.

In 2012, coal production was equal to 6.345 million tep (tons equivalent oil), to which imports of 0.765 million tep were added. The lignite production was equal to 5.692 million tep, to which minimal imports of 0.01 million tep were added.

Houille is exploited ever since 1790 in the Banat Mountains and since 1840 in the Petroşani Basin, the latter representing the most important houille basin in the country, were almost 80% of the production was completed. Houille exploited here is coking, especially the production in the Vulcan, Lupeni, Uricani and Paroşeni mines. Lesser quantities of houille are exploited in the Banat Mountains mines: Anina, Ponor, Cozia and Baia Nouă. Brown coals appear in reduced quantities and are exploitable in the Comăneşti, Almaş and Brand-Ţebea basins (Ipedia, mica enciclopedie.).The objective of the *National energy strategy* is to make houille weight to grow over 7%.

Lignite holds the country's biggest carboniferous quantities (over 70%) and occupies and important place as producer and consumer (almost exclusively for thermal plants). From the total of electricty obtained in therma plants, the weight of those using lignite was 44% in 2012, a slight drop from 2011 – 45,5% – which follows the general tendency to reduce coal as an energy source. The biggest deposits lie in the Getic Plateau, where the most important basin is also found: Motru-Rovinari. Works here are done in a quarry (over 80% of lignite reserves can be efficiently and profitably exploited in this way) at Rovinari, Urdari, Lupoaia, and underground at Motru, Horăşti, Leurda, Ploştina. Lignite resources can also be found in the Getic Subcarpathians, in the Mehedinți Plateau, in the Subcarpathian area between the rivers Argeş and Buzău, in the Dealurile de Vest region, Baraolt, Valea Crişului.

The weight of oil in the production of electricity is in a continual decrease, justified by the current EU regulations; as such, in recent years it has halved, from 2.1% in 2009 to 1% in 2012.

The country's oil production was 3.891 million tep tons in 2012, not enough to cover the necessary economic consumption; imports amounted to 5.126 million tep tons. Oil production is concentrated in over 10 500 drills, operating in regions belonging to every major landform. Ever since 1969, Romania started operations to explore the Romanian continental platform of the Black Sea, and in 1987 the first oil quantity from the Black Sea platform was extracted. It was started ever since 1969, the first hydrocarbon discovery occurred in 1980 and the first sea production started in 1987. Since 2009, the Petrom company has started exploiting two new deposits, Istria XVIII and Neptune XIX. Under the report of deposit sizes and weight in the national production, the region between the Carpathians and the Danube remains the most important, with 70%. The main production areas are: the Getic Plateau and Subcarpathians, exploited since 1950, where over 50% of production is obtained at great depths, between 4,000 and 6,000 m; Câmpia Română since 1960, assuring 25% of the country's production; the Subcarpathians between the Danube and Buzău, old, with deposits in an advanced state of exhaustion; Câmpia de Vest has modest weights; the Moldavian Subcarpathians – the oldest one in the country.

The small deposits, the insufficient production have determined Romania to be open to initiatives appeared in the EU regarding the diversfication of oil supply sources. Ther have been several options and projects that, because of geopolitical changes in the last 10 years, were either put on hold from one year to the next or completely cancelled.

Regarding natural gas participation as fuel in thermal plants, one can observe the decrease in weight from 25.3% in 2007 to 18% in 2009, followed by a slight comeback in 2012 at 19.8%.

Estimations regarding Romania's natural gas reserves have reached significant decreases from 184.9 billion cubic metres in 2006 to 100 billion cubic metres in 2012. By comparison, the production of natural gases has registered oscillations during 2006-2012 of around 8.8 million tep tons. The production mentioned was obtained with over 3,500 drills, 3,000 of which in Transylvania, placed on 150 gas structures with depths ranging from 2000 to 3000 m. Over 30,000 km of pipeline assure extraction, transport and distribution of natural gases, of which 11,000 km are main pipes and over 4,000 regulation and natural gas measurement stations.

Tradition in this field is old: the first methane extraction drill was first used in 1908, at Sărmăşel, and in 1909 drills at Zau de Câmpia, Şincai, Saroş, Copşa Mică. In the period 1912-1913, a pipeline is built for the transportation of methane gas between Sărmăşel and Turda, the first one of its kind in Europe, and in 1918 the first gas lamp for public lightining throughout the country is lit at Turda.

Methane gas forming the biggest part of the Romanian reserves is found in geomorphological structures as arches, vaults called domes, identified in the Transylvanian Plateau. In the mentioned area, of the 67 gas fields, 54 have been identified after 1948. Extraction in the Transylvanian Plateau is made in two areas: one is situated between the two rivers Someş, a hilly region with altitudes varying at about 500 m, called the Transylvanian Plain, and the second one is south of the Mureş, in the hilly region of the Târnave Plateau (500-600 m height).

Drill gases are exploited in petroliferous structures in the Subcarpathians and the Getic Plateau, Câmpia Română, Câmpia de Vest, as well as the Moldavian Plateau.

Current natural gas productions do not totally satisfy the need of the Romanian economy; imports coming mostly from the Russian Federation, whose value was in 2012 2.321 billion tep tons, are required, especially in the cold season. The stakes of a higher production cannot be taken into consideration with regards to a consumption level that will surely rise.

As opposed to 2012, 2013 registered **decreases in energy delivered from plants functioning on solid and liquid fuel**, as well as **increases in the ammount of delivered energy by plants functioning on gasseous fuel, hydro- and thermal plants using renewable sources.** The biggest decrease was registered in the amount of energy delivered from plants functioning on the solid fuel.(Autoritatea Națională de Reglementare în domeniul Energiei (National Authority for Regulations in the field of Energy), *Annual report*, 2013).

The European commission adopted in 2009 **the compulsory objectives regarding renewabe energy sources**; the main purpose is to reduce consumption of coals, oil and natural gaseses, reduce pollution and gas emissions causing the glass house effect, as well as production costs for energy from renewable sources. This situation creates a more diverse palette from the perspective of energy sources.

The types of regenerating resources taken into consideration by the EU are, generally, the following:

- ✓ wind energy (both on-shore and off-shore)
- ✓ solar energy (termic, photovoltaic as focused);
- ✓ hydroelectric energy;
- ✓ tide energy;
- ✓ geothermal;
- ✓ energy obtained from the biomass (including bio-fuels and bio-liquids).

The purpose of bringing renewable source into discussion is that it aims to reach a weight of 20% of the energy originated from these sources from the total energy of the EU, threshold established for the year 2020.

A common objective has been laid out for transports, which must be completed by all states of the Community; that is 10% from energy consumed has to come from other renewable sources.

In 2010, the energy quota from renewable resources in the EU reached 12.7%, and the majority of member states had already reached their intermediary goals imposed by the directive for 2011/2012. In what regards EU credibility, the application of member states of the bio-fuel scheme is considered too slow. Nowadays, the potential negative impact of bio-fuel consumption does not require further specific political interventions (European Commission, 2013), *Intermediary report regarding energy from renewable sources.*)

Last year, Romania was on the 10th place worldwide with regards to the capacity of working Eolian parks, according to statistics published by the European Association for Eolian Energy.

According to this source, the local market had a weight of 2.1% of the total Eolian capacities working in 2012, with a total of 923 MW (Petrescu, 2013), "*România, locul 10 în lume la capacitatea turbinelor eoliene instalate anul trecut. China şi USA domină piaţa globală a vântului*", Ziarul Financiar.).

The most important Eolian projects developed in Romania are localized in the following geographical regions (Autoritatea Națională de Reglementare în domeniul Energiei (National Authority for Regulations in the field of Energy), *Annual report*, 2013):

- Dobrogea
- The Fântânele-Cogealac park, comprising 240 Eolian turbines with a capacity of 600 MW, where the first turbine was functioning the 1st of Hune 2010, and the final one in November 22nd 2012
- The Eolian park at Corugea (județul Tulcea), working since 2011.
- Banat
- The Moldova Nouă Eolian plant with a capacity of 48 MW.
- Moldavia
- Large-scale projects are underway within the borders of: Botoşani, Iaşi, Suceava and others.

Eolian energy produced by dispatchable producers was almost 2 times as big as opposed to last year, reaching an annua total of over 3.67 TWh; hydro-energy has increased by 23%, and energy from gassesous sources has increased by 14%. **Overall, a decrease of approximately 0.8% was observed in electrical energy injected in networks and products from both conventional and nonconventional ways, from dispatchable units (UD's).[3].**

In 2015, the energetic map of Romania will suffer changes, which will be in accordance to the European Commissions's proposals in the field of energy: 32-33% of the hydro-energy and from renewable sources; 25-28% nuclear energy and 39-43% energy from hydrocarbons and coals.

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