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## Directions regarding Romania's energy security

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## **Introduction**

Energy has become a strategic factor in global politics, a vital component for economic development and the general progress of society, creating a series of global concerns just after the end of the First World War.

Now, the energy's oil and gas component represents the biggest challenge but also cause for concern not only at a European level but also at a global one. This depends on many factors: the reserves, the countries that manage these reserves, these countries' policies, the transit routes, the geopolitical context and the economic and diplomatic power.

Lately, the term "energy security" is often used, being considered the key to regional security: "any failure of the critical energy infrastructure<sup>1</sup> has the potential of a political, military and social impact."<sup>2</sup>

But, a greater energy security means, mainly, a greater diversity of supply sources. Thus results the major importance of the projects involving the transport of energy resources such as oil and natural gas.

At the moment, Europe is increasingly dependent on energy resources, and consequently in search of new suppliers in order to ensure its demand and security. Current projects reflect not only Europe's interests in the Caspian Region and Northern Africa, but also its intention of limiting the dependence on Russia. The latter, as supplier, wishes to limit its dependence on Ukrainian transit space, shifting attention towards Turkey, while initiating alternative projects to those promoted by the European Union.

Europe possesses one seventh of the global energy consumption and is dependent on imports for more than half of the necessary energy. In order to face the skyrocketing demand of hydrocarbons the European Commission has taken over the leading role in developing strategic energy partnerships with European Union's traditional suppliers – Russia, OPEC, Norway and Algeria – but also with alternative suppliers from the Caspian Basin, Central Asia, North Africa and South America. As a matter of fact, not only the European Union is concerned with energy security but also the most important military alliance in the World, NATO; for example, during the recent Summit, held in Bucharest (2<sup>nd</sup> - 4<sup>th</sup> of April 2008), one of the main issues was energy security and establishing clear strategies for the future.

As far as Romania is concerned, our country is for the first time faced with the situation that both its geographic and geopolitical position provides opportunities which should be fully capitalised.

The geopolitical and geoeconomical context in the Black Sea Region has greatly changed over the past few years due to the major powers' shift in interest towards the Pontic-Caspian space, in Romania's proximity. Thus, our country has the potential of becoming a "gateway" into the economical-political regional block of the European Union and a transit space between Central-Asian producers and the large European consumers (taking into account the proximity to the energy resources deposits, but also the oversized infrastructure – the oil pipelines network, the largest refinery in the Black Sea Basin – Midia Năvodari, the size of the petrochemical industry etc., the permissive topographic area which doesn't imply particular economic and technical difficulties – such as pumping stations with afferent costs, the largest harbour in the Pontic Basin – Constanța and so on).

On the other hand maximising the output of the Cernavodă nuclear power plant and the remarkable bio energy potential represent viable alternatives for maintaining low energy dependence to outside sources.

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<sup>1</sup> Critical infrastructures are extremely important infrastructures, which are connected to the national security of each country.

<sup>2</sup> General James L. Jones' statement (Supreme Commander in Chief of the NATO Allied Forces in Europe) in *National Security and critical infrastructures*, „The oil and gas screen” no. 5 (63), 2007, page 48.

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The current study is structured in three major sections: 1. conceptual aspects regarding energy security, 2. the problems of renewable energy and 3. considerations regarding Romania's energy strategy, taking into account the present geopolitical and geostrategic conditions, both globally and regionally.

The objective of this research was the analysis of the balance between opportunities and risks generated by the new geoeconomical, geostrategic and geopolitical conditions and issuing directions for Romania's energy security strategy in a European and global context.

## **1. Energy security**

### **1.1. Energy security – major component of national security policy**

*Energy policy* is increasingly seen as an interdisciplinary issue that interacts with other areas: trade, environment, climate, social policies and, last but not least, with national security.

Energy is an area of strategic importance because ensuring it at reasonable prices affects economic competitiveness, domestic production capacity and political force of a state. Security of energy supply affects the welfare of a state and changes in energy prices affects the welfare allocation at the national level. And, last but not least, the defence ability of a state depends on a good energy supply.

**Energy security** is a complex concept political, technical, economic, commercial and social. As an axiom, absolute energy security does not exist. It can be done at an acceptable level of risk, with an acceptable cost. As a synthetic definition, *energy security means ensuring the continuity of energy supply of a country in its various forms in compliance with some restrictive conditions on a given horizon of time.*

It involves ensuring consumer needs, in terms of *accessibility* (to new supply sources) and *availability* - namely ensuring the long-term continuity of supplies. Long term measures to increase energy security center on reducing dependence on any one source of imported energy, increasing the number of suppliers, exploiting native fossil fuel or renewable energy resources, and reducing overall demand through energy conservation measures.

The energy security has a cost (usually high) either to build emergency stocks, diversify the types of energy used and the supply sources or to carry out research and investment for energy conservation. The key problem of the energy strategy is to fix the costs limit an economy can afford in order to increase its energy security, in terms of economic efficiency. A similar problem arises in case of environmental protection, but this could come into conflict with a policy of minimizing costs.

Related to the previous ones, another issue, put in balance the security of energy supplies with the cost of this operation. From this dilemma derives other essential questions: to what extent should the national energy sector be encouraged to reduce external dependence and increase the energy security and if so, how and who should bear the cost subsidization of these operations; to what extent these practices do not come into conflict with competition laws and with the liberalization of energy markets?

**The tools** that can ensure security of energy supply are: *adequate energy production and transport facilities* capable to alternate fuels in combustion processes and diversification of external sources of supply, *more efficient energy technologies*, able to decrease the specific energy consumption and last but not least, *competitive and liberalized energy markets*.

The more and more limited energy resources, subject to a growing demand, to strong upward trend in prices of oil and natural gas in recent years, turn energy into a profitable good, but also place it to the center of internal and international confrontations. Under these circumstances, the "strategic" and "commercial" sides of energy are complementary and even

overlap. Another contradiction arising from the multivalent character of energy is that *addressing energy as a commodity requires a free market, and as a strategic good, involves protection, government involvement.*

In recent years, energy governance operated on a territory where it faced on the one hand, a system based on market and institutions (the rule of law), and on the other hand, on geopolitical systems of power concentration at the level of regional blocs.

*Multilateral governance'* main objective has been to face the challenges related to the interdependencies of market power by applying fair rules and a free access to resources and investment moderated by market mechanisms, with a strong involvement of private companies.

*The geopolitical model* aims to provide exclusive access to resources, primarily by political or military means. On the other hand, the uneven geographical distribution of reserves and the need to ensure their transport over long distances to consumer markets, are supposing taking into account certain strong geopolitical considerations.

Seen from the viewpoint of **consumers**, *energy security means geographical diversification of supply, use of a larger variety of energy resources and predictable, stable and cheaper energy prices.* The economic objectives of energy importers are: minimizing energy costs, profits' increase and avoiding failures in the supply of energy.

On the other hand, **suppliers** *seek stability of energy demand and the strengthening of their dominant market position, even obtaining monopoly on the market.* Thus, while the buyer is interested in competition at the supply level to keep prices at low levels, the supplier is interested in competition at the demand level in order to keep prices high.

From this perspective, rapid fluctuations in energy prices constitute a major problem because of the redistribution effect, given that energy is part of most goods and services. Many states are reserved to open their market to foreign investment *as investors require the existence of certain standards in terms of markets, economic reforms and political stability in beneficiary areas.*

European Union is opting for a *model of multilateral governance*, acting towards underpinning international energy trading relationships to ensure the access to new sources by strengthening economic cooperation, political, cultural, through the establishment of a dialogue and of common responsibilities related to environmental protection and stopping the process of global warming. EU believes that energy security can not be accomplished individually, but through the collective efforts of all participants in the energy market: manufacturers, suppliers, consumers. At the same time, the EU is disadvantaged by its poor natural endowment in energy resources, high energy consumption, increased dependence of import of energy sources- which causes a high degree of vulnerability / dependence on energy imports. UE is trying to diminish its vulnerability through much more pragmatic and firm relations with energy suppliers.

The European Council stressed the need for the adoption of new measures with the occasion of the next revision of strategic energy policy to be presented in November 2008 and adopted by the European Council in spring 2009.

They will serve as the basis for a new action plan on energy, which would be adopted by the European Council in spring 2010. This strategic review of energy policy will focus in particular on security of supply, including interconnections and external energy policy.

As an EU member state, Romania should become a supplier of energy security for the Union, addressing it by supporting its objectives and actions at the national level.

The energy sector in Romania will have to face the main challenges that are prevalent at national level, as well as at EU scale and worldwide: ensuring security of energy supply, increasing economic competitiveness and reducing the impact on the environment. These challenges are even more important as Romania has recovered from severe gaps in terms of the degree of economic performance compared to developed countries. Both economic competitiveness and sustainable development depends largely on efficient consumption of

energy resources. Romania recorded an extremely high energy intensity in comparison with the EU average (approximately 3-4 times greater). Moreover, comparative analysis of competitiveness indicators shows that energy intensity is the competitiveness factor recording the biggest gap as against EU countries

One of the most important objectives which energy strategy has to meet in view of the concept of energy security is to reduce dependence Romania's dependence to the imports of energy resources - especially in natural gas case, reducing dependence on a single supplier and diversifying supply sources. This can be achieved by taking into account the criteria of *affordability*, which must consider the geographical location of suppliers and *availability*, which relates to ensuring longstanding and constant deliveries.

## **1.2. Risks and failures in ensuring energy security**

The uneven distribution of energy supplies among countries and the critical need for energy has led to significant vulnerabilities.

Threats to global energy security include the political instability of several energy producing countries, the manipulation of energy supplies, the competition over energy sources, attacks on supply infrastructure, as well as accidents and natural disasters. It is also the limited supplies of the most common forms of primary energy, i.e. oil and gas that changes perceptions on this topic. Although plenty of coal, up to 155 years worth, is readily available, coal is not the fossil fuel of choice for many more advanced countries because of its highly polluting nature. The potential need to change our primary energy sources in the foreseeable future is the crux of the energy security question leading to higher prices, more limited access to sources of energy, competitions and political troubles, which in turn make the threat even larger.

*A. Physical risks* refers either to the possibility of a permanent physical interruption of supply, especially of oil - the central axis of economic consumption of EU Member States, particularly in the transport sector - generated by the exhaustion and / or abandonment of energy sources, or to a temporary interruption caused by factors of "force majeure", natural disasters, etc.

*B. Economic risks* refers to the vulnerability of the economic environment under pressure exerted by energy prices fluctuations, in particular by the high growth of crude oil price, which is the benchmark of energy prices. Economic risks arise from the volatility of markets and oil prices. Theoretically, a strong increase in prices leads to an increase in production costs, which induces an inflationary pressure either directly or indirectly in every economic sector which, in turn, causes a decline in consumption. This leads to decreased profits for most companies, to production cuts, postponing investment decisions, and to increased unemployment. On the other hand, cheap oil was a big disadvantage for developed countries and the most "pervert" enemy for energy security. This blocked the possibility to resort to alternative energy sources, like renewable sources (more expensive) and to develop new oil fields, by encouraging wasteful practices and discouraging energy saving practices. Finally, it has contributed to increasing dependence of consumers on a small group of producer countries with the lowest costs, located in the Middle East.

Until early 2008, the world economy was generally able to absorb the effects of the increase of prices of crude oil, from the latest 2-3 years, because of the following reasons:

- In real terms, that is adjusted for inflation and exchange rates, prices were lower as compared with levels recorded during the oil shocks;
- Western countries economies have managed to considerably improve the efficiency of their energy consumption;
- The massive subsidies to the energy cost, granted in developing countries, in particular in India, China, Russia, the OPEC countries etc.

The evolution of GDP structure in the developed countries towards the tertiary sectors of economic activity had a series of favorable effects on energy intensity: *effects of structure* - derived from the changing modes of production (diminished relative weight of energy intensive industries in favour of services' sector); *effects of saturated markets*, appropriate to the countries with zero population growth and with industrial infrastructure almost complete; *effects of specific consumption* – materialized in diminished specific energy consumption required to obtain a unit value of GDP (measured in constant currency).

During the first half of the year 2008, the cumulative effects over a long enough period of oil price rise began to affect world economic growth and implicitly demand for crude oil, but the decrease rate in the dollar against European currencies has contributed indirectly to limit the effect of oil price increase on the euro area.

#### *C. Geopolitical and geostrategical risks*

Energy is a vital source of interest for both producing and consuming countries. Uneven access to resources, special geopolitical interests of great powers, are potential sources of conflict between the consuming countries as well as between them and the producing ones. The political conflicts in the oil producing areas, including terrorist events, represents a severe threat to both current supplies of crude oil and prospects of huge investment needs to develop resources to their full potential.

Given EU demand for hydrocarbons tends to be satisfied in a growing proportion from the Persian Gulf, Caspian Sea region and Russia, importing countries fear:

- a political instability in the Caspian Sea and the Gulf area;
- the points of risk in critical infrastructure (risk of interruption of supplies, terrorism);
- an intensifying competition among consumer countries to ensure control over the resources of crude oil and natural gas, mainly between U.S., China and the EU.

The security concerns related to the imports does not justify the adoption, of the "self-supply" concept, which would impose huge costs for environment and competitiveness protection. Instead, EU governments and energy companies will need to work together to ensure continuity of supply at reasonable prices. For example, the Caspian basin represents at the same time an area of confluence and confrontation between the interests of the three major players: the U.S., Western Europe and Russia and the sine-qua-non condition for turning into account these reserves is to provide the adequate infrastructure for transport to Europe either through Russia's territory or through other routes.

#### *D. Social Risks*

Instability of energy supply, whether it is linked to chaotic fluctuations of prices, to the relationships with producer countries, or geopolitical crises can cause serious social disturbances and changes in corporate behavior. Strikes and protests in May-June 2008, which involved some social categories affected by increasing oil prices, especially commercial carriers from Western Europe countries are an illustrative example for the purposes specified. It should also be recalled that the first two oil crises (from the years '70-'80) have put an end to a beneficial period in terms of employment level. High energy prices require governments engagement in finding solutions to make these prices bearable, particularly for the most disadvantaged population.

#### *E. Risks associated with environmental protection*

Risks of disruptions related to the environment derive from sources such as: accidents caused by the energy supply operations chain, technical accidents and first of all the polluting emissions from energy consumption systems. The European Union is committed to working constructively for a global agreement to control climate change and for an energy security improvement. Both are linked, intrinsically, to the way people are producing and consuming energy. And both have implications on foreign policy and security. One of the major challenges for the European Commission, and generally for the EU is ensuring competitive and "clean" energy for Europe, by tackling climate change, escalating global energy demand and uncertain future of resources.



### **1.3. Policies and instruments aimed at increasing energy security**

#### **1.3.1. Specific features of the energy sector that affect energy security**

The importance of the energy sector (resources - energy industry - consumption), a strategic sector for any state, is best underlined by the fact that, including the case of Romania, energy is a product with a high economic, social, political and strategic value. One can not build a modern evolving economy and society, without an efficient energy industry, able to ensure and support with energy various economic sectors and social development. Lack of access to energy has great consequences and the role of strategic and political power was clearly shown in the past 30 years by the various oil crises, regional conflicts, serious damage energy, social tensions or errors in the energy policy of a country.

National energy sector has a number of **specific characteristics** that influence in a different extent the energy security, namely:

- The existence of an **appropriate legal and institutional framework** and of an energy strategy for medium and long term, accompanied by a national energy policies and of instruments specific to free economy.
- Providing long-term access to **internal and/or external sources of primary energy**, in accordance with the country's energy balance and change in its structure. Diversifications of supply sources and implement a balanced mix of resources have a tremendous importance.
- **Interruptions in energy supply** can have serious economic and social consequences. For example, such an event occurred in 2003 in the U.S., the New York area, which lasted 24 hours, caused a damage of about 20 billion USD. The interconnections of electrical systems, for example, the system of Romania to the European energy system is likely to reduce greatly the consequences of such events.
- **Energy sector is a system with a large inertia**, and with a constant time between the decision and the practical realization of 4-20 years. Thus, the construction of power plants requires usually 4-6 years, and of electrical lines 6-8 years, the achievement of a national program of energy efficiency takes 10-20 years. In these circumstances, it is very important when the decision is taken, so that the energy project to become functional.
- Energy sector requires **considerable investment**. Thus, the EU documents concerning energy of January 2007, state that in the year 2030, modernizing the energy sector requires about 900 billion euros. In the case of Romanian energy system, the official data said a necessary annual investment of approximately 1.5 - 2 billion euros is needed. One must realize that, in the case of Romania, obtaining these funds is particularly difficult; depending directly on how the country is perceived as a safe investment environment.
- The energy sector has **the greatest impact on the environmental emissions** produced, as energy contribution is valued at around 80% to environmental pollution, and therefore to the phenomenon of global warming. In this context, all ways and means to reduce this impact acquire a special significance, namely: the promotion of energy efficiency can reduce energy losses, respectively the expand of the use of renewable energy sources, reconsidering nuclear power, improvements to the energy market, etc.
- Energy, as a complex sector, mobilizes considerable funds in the money business investment, in the supply of primary resources, in carrying out programs for energy efficiency and modernizing, the activities of the competitive energy market. In this context, **the ethics problems in energy** acquires a special importance, namely the strict compliance

with the legality of all procedures, an increase of accountability of political governmental decision factors to avoid the interference of the state in commercial transactions.

- Energy requires **an appropriate institutional framework**. In 1990, the former "Minister of Electrical Energy" was abolished and all activities in the energy sector were introduced as departments or directorates in the Ministry of Economy and Resources (Industry, etc.). Furthermore, as a way of representation in the government, energy has not been a priority and it was treated as non important, with major economic and social consequences. Today, energy represents by far the main concern of the Ministry of Economy (and Finance). Delayed restructuring and privatization of energy, those that were made, took place mostly at the pressure of international institutions (EU, World Bank, IMF, USAID), with modest results. Present major problems facing the energy sector (big energy losses from the industry and residential sectors, district heating, the deficiencies of the energy market, the large impact of energy on the environment, reduced investment sources and others) make it to be today unsustainable, and is largely due to a lack of appropriate institutional framework. Sustainable economic and social development of Romania's medium and long term depends on the existence of an efficient energy sector, which, in its turn, is determined by a modern legislative and institutional framework, lined up with the EU energy and environmental policy.

It is necessary to establish the “**Ministry of Energy and Natural Resources**”, as an institutional governmental structure responsible for national energy policy elaboration, of the policy instruments and mechanisms in the field of primary energy resources, including renewable resources, import of resources, production and efficient use of energy, the impact of energy on the environment, in order to ensure national energy security, sustainable energy development and energy costs affordability.

**It must be understood at all decision levels that the coming decades will be dominated by the challenges of developing an energy efficient, competitive, low carbon, and energy secure economy.**

### 1.3.2. The structure of energy balance

Table 1 shows the annual consumption of primary energy resources of Romania in 2007 and Table 2 the final energy consumption for the same year. The data in Tables 1 and 2 are taken from "Projections of energy balance for the period 2008-2013", published by the National Commission for Prognosis of Romania, on 15 June 2008, based on data published by the National Institute of Statistics.

Table 3 presents the potential energy savings for different sectors of consumption. This potential has been the subject of a thorough analysis of the energy situation of Romania, made by the paper "In-depth Review of Energy Efficiency Policies and Programs of Romania", prepared by the Energy Charter Secretariat, Brussels, in 2002.

Table 1 - Annual primary resources of Romania in 2007

<b>Total energy resources, mil.toe</b>	<b>49,124 mil.toe</b>	<b>100%</b>
1. Primary energy resources, of which:	47,874	97,45
1.1. Domestic production, of which:	27,313	55,60
- Coal	6,410	13,05
- Useable natural gas	9,652	19,65
	4,943	10,06

- Extracted crude oil	1,370	2,79
- Hydropower	1,705	3,47
- Nuclear	3,233	6,58
- Other resources *		
1.2. Imports of which:	17,186	34,98
- Coke	0,481	0,98
- Coal	3,073	6,25
- Natural gas	3,904	7,95
- crude oil	8,534	17,37
- Petroleum products	1,085	2,21
- Electricity	0,109	0,22
1.3. Stock at the beginning of the year	3,375	6,87
2. Stock in energy transformation	1,250	2,55

\* Includes non-conventional energy (wind and geothermal), biomass, firewood and other fuels.

Table 2 – Final consumption of energy of Romania in 2007

<b>Total consumption of energy, mil.toe</b>	<b>49,124 mil.toe</b>	<b>100%</b>
1. Domestic consumption, of which:	39,484	80,38
1.1. Consumption of energy sector	7,456	15,18
1.2. Losses	3,869	7,88
1.3. Available for final consumption:	28,159	57,32
- Not for energy consumption	2,644	5,38
- Final energy consumption, of which:	25,515	51,94
o Population	o 8,000	o 16,29
o Economy, of which:	o 17,515	o 35,65
a) Industry	a) 4,470	a) 9,10
b) Constructions	b) 5,450	b) 11,09
c) Agriculture, forestry, fishery	c) 0,265	c) 0,54
d) Transportation and communications	d) 4,470	d) 9,10
e) Other activities	e) 2,860	e) 5,82
2. Export	6,150	12,52
3. Stock at the end of the year	3,490	7,10

Table 3 – The potential of energy savings in different consuming sectors

Potential of energy savings	Value
Industry	20-25 %
• Cast iron production	20 %
• Steel production in electrical furnaces	20 %
• Ammonia production	10-30 %
• Sodium hydroxide production	15-30 %
• Petrochemical industry	12-50 %
• Pulp and paper production	25-45 %
• Food industry	25-30 %
• Mining industry	30-40 %
Buildings	40-50 %
Transports	35-40 %
<b>National potential</b>	<b>30-35 %</b>

*Source: Energy Charter Secretariat, Bruxelles, 2002*

Table 4 presents the primary energy resources, according to the "Energy Strategy of Romania for the period 2007-2020", approved by GD 1069/2007 and published in the Official Gazette no. 781/19 November 2007.

Table 4 – The situation of domestic primary energy resources of Romania

Resources carrying primary energy	Reserves						Estimated annual production	Period of estimated insurance		
	Reserves		Reserves exploitable granted		New premises			Geological reserves	Reserves exploitable granted	New premises
	million tonnes <sup>1)</sup>	mil. toe	million tonnes <sup>1)</sup>	mil. toe		mil. toe	million tonnes <sup>1)</sup>	years	years	years
1	2	3	4	5	6	7	8	9=2/8	10=4/8	11=6/8
Coal										
-hard coal	755	422	105	38.8			3.3	229	32	
-lignite	1490	276	445	82.4	1045	133	32	47	14	33
Crude oil	74	72					5.2	14		
Natural gas	185	159					12.5	15		
Uranium										

<sup>1)</sup> Exclusively natural gas, in billion m<sup>3</sup>

<sup>2)</sup> Clasified data

<sup>3)</sup> The period for a concession is of at least 2 years, and the opening of a new area at the design capacity can exceed 5 years.

*Source: "Energy Strategy of Romania for the period 2007-2020"*

Concerning the structure of Romania's energy balance the data presented above show the following:

**A. Romania can be considered today a rich country in poor and expensive resources**, having a diversified range, but a reduced quantity of primary energy resources (Table 4).

**Hydrocarbons** (oil and gas) are in an advanced process of depletion in the next 14-15 years at current consumption. Current oil reserves are estimated at 74 million tons, the annual extraction in 2006 being 5 million tons. Natural gas reserves are estimated at 185 billion m<sup>3</sup>. ROMGAZ experts say that significant studies on the reserves of natural gas in the past 10 years have not been carried out, and pressure in about 80% of extraction wells is less than 10 bars, which makes the transportation of natural gas to be made economical only on short distances, and, on the other hand, fastening the process of exhaustion. **Coal** reserves (hard coal and lignite) are considered as sufficient for the next 14-45 years. There are a number of specific conditions (poor quality of lignite, large subsidies to hard coal), leading to high costs of production and a reduced competitiveness of the extractive industry in Romania. Exploitable reserves provide a production for the next 32 years for hard coal and 14 years for lignite (one can add a period of 33 years of exploitation of deposits of new areas).

**Hydropower and nuclear power** represent expensive primary sources, in terms of capital invested. Regarding the energy hydropower, Romania puts in value nearly 50% of the economic hydraulic potential, but the most profitable projects; the rest of the works will require considerable investment, however, reflected in high prices of electricity. For **nuclear energy**, Romania still has reserves of uranium ore, but with a poor concentration, which can ensure the operation of two nuclear reactors by the year 2017.

**B.** The annual primary resource in **2007** was (Table 1) 44.5 mil.toe (27.3 mil.toe domestic production and imports of 17.2 mil.toe), of which **63.2% hydrocarbons and 22.4% coal**, and in **2005** (according to the "Energy Strategy of Romania"), of 37.9 mil.toe, of which **60.6% 23.0% hydrocarbons and 23.0% coal**. One can be comparatively appreciate that the decreased production of hydrocarbons may be compensated by increasing the extraction of coal.

**C.** An important conclusion is that **the balance of the primary resources of Romania is based at the rate of 60-65% on hydrocarbons**, the internal reserves being in an advanced process of depletion. In the same period, 2000-2005, **the dependence on imports** of primary resources (in the majority, hydrocarbons) increased from 27.1% (in 2000) to around 36% (in 2005). As an order of size, the cost of hydrocarbons imports in 2007 were of about 4 billion euros.

**D. At the high volatility of prices** for natural gas and oil in the last period of time the high bill of imports of hydrocarbons is likely to increase the economic and social pressure in Romania and to reduce the energy security of the country.

**E.** Table 3 highlights **the energy losses particularly high in all sectors of consumption of energy**, namely 30-35%, value confirmed by The Romanian Agency for Energy Conservation (ARCE). "Romania's energy strategy" estimates an energy savings economic potential of 6.8 million toe, respectively 27% of final energy consumption. Romania is regarded as having probably the highest energy intensity in the EU countries. It follows as **an obvious conclusion**: Romania has reserves of hydrocarbons in the process of depletion and makes big efforts for hard currency to pay higher imports of oil and natural gas, but "tolerates" the energy losses of about 1/3 of consumption, with relatively few concerns to reduce them.

**F.** In the present and future national and international scene, Romania's access to primary sources of energy represents again condition for the economic and social development. Due to the lower level of economic development, the gross consumption of primary energy per capita (1.8 toe/per inhabitant) in Romania is about two times lower than in the EU countries. As a result, the structure of the balance of the primary resources of Romania will have to undergo a number of dynamic changes that will accommodate in real-time the influence of such factors as the increasing of oil and gas prices, increased participation of

nuclear energy, of coal and renewable energy sources, the promotion energy efficiency, diversification of external sources of primary energy.

G. "Romania's energy strategy" shows that: "After 2012, the export of electricity will exceed the production by using the liquid and gaseous fuels imported. The country's energy balance will thus become in surplus for the first time in history". This assertion is however seen as unlikely by experts for several reasons, including: liquid and gaseous fuels will have the highest prices and will lead to an expensive energy produced; existing thermoelectric power plants have in the majority modest technical and economic performances, the export of energy involves competition with other producers in the neighboring European countries.

### 1.3.3. Diversification of supply sources

#### **Alternative sources for natural gas offer**

The gas can enter the EU from a number of sources. But even in this case, security of supply is illusory so long as transport connections between Member States to ensure the free movement of gas on the continent, are insufficient and the markets are fragmented. In fact, the concept of single market without an interconnected transmission and distribution infrastructure is an economic non-sense.

The European Commission is concerned by the adoption of appropriate measures to improve the existing infrastructure of transport and storage of natural gas and to encourage the development of new infrastructure objectives based on the idea that developing natural gas constitutes a basic prerequisite to ensure a competitive market structure and, implicitly, the security of energy supply.

Motivations in this approach were as follows:

a) uncoordinated planning and operation of energy networks from member states hinder the process of integration of national markets into a single market;

b) the absence of long-term measures (investments in networks and in adequate stocks of crude oil and natural gas) do not allow member countries to initiate joint action in crisis situations;

c) insufficient trans-European networks, for energy transmission (TEN-E) and interconnections which deprive the new EU Member States of access on fair, diversified sources of gas, and leads to a lower level of cohesion within the EU.

The EU Priority Interconnection Plan, 10 January 2007 found that, although gas projects implementation has been more succesful than that of electricity, in some Member States, the achievement of terminals and storage facilities have encountered major problems that have finished to be frozen. It has been stressed that external interconnections require special attention because they provide more than 50% of gas imports, and their construction becomes increasingly politically motivated.

The European Parliament and the Council reiterated two policy priorities, namely a stronger support for the implementation of the internal energy market and identification, and then turning into practice of twelve priority natural gas transport projects of European interest.

For Romania, the main conditions required for imports of gas from sources other than Russia to become competitive and, implicitly, the degree of geographical diversification of imports to grow are as follows:

- turning to account the investment projects needed to diversify the transportation routes, primarily the interconnection to Western Europe network;
- ensuring a non-discriminatory access of third parties to transport, storage and distribution networks.

Interconnection to the pipeline network from western continent is the main hope to improve the competitive climate in Romania, although Gazprom holds an important commercial position even in these networks.

Interconnection involves the development of contractual relationships and discourages vertical integration in the gas industry, encouraging the access of new companies entering the Romanian market for gas. The degree of interconnection is one of the most important indicators for measuring the competition, even more important than the degree of market opening and the share of eligible consumers.

In case a local deficit would arise, local interconnection will allow the supply from other gas sources, providing a leveling of price effects (even if they are higher) by including and weighting them in the "basket" of gas practiced in Romania.

The interconnection process of Romania's high pressure gas pipeline network aims at the following objectives:

- Interconnection to Western Europe network, which should be achieved by completing the pipeline Nadlac-Arad-Szeged;

- Interconnection to the Ukrainian system (Huși-Satu Mare);

- Interconnection to the Republic of Moldova's system (Balti-Ungheni-Iasi);

- Interconnection project to the Bulgarian network, on the route Turnu Magurele-Pleven.

As far as the free access of third parties (TPA) one can mention that, National Transport System(NTS)- that is the high pressure gas pipelines network- has been passed in the ownership and management of a distinct company (TRANSGAZ) and is now operated under conditions of regulated access in accordance with the provisions of the EU Gas Directive; but, the effective access to the transmission network is allowed, so far, only to gas imported by eligible consumers and to some consumers directly connected to the NTS. All charges (transport, distribution, storage) are of a fixed amount, influenced by distance and the volume transported.

#### 1.3.4. Interconnection of the national energy system

The electricity transmission network (RET) is the network of national and strategic interest with line voltage greater than 110 kV, namely 220 kV, 400 kV and 750 kV. The transmission network makes the interconnection of the generators with the distribution networks, big consumers of energy and neighboring electrical systems.

As a transport and system operator, The National Company Transelectrica provides:

- a) The management, operation, maintenance, modernization and development of the electric transmission networks, including the of the interconnection capacities of the National Energy System (SEN) with other neighboring energy systems;

- b) The regulation and coordination of services of connection to the electricity transmission grid;

- c) The operational planning, programming and control, within the control by the dispatch of the National Energy System (SEN);

- d) The establishment, contracting and management of system technological services;

- e) The fulfillment of all tasks specific to Transelectrica as:

  - Market operator balancing;

  - Measurement operator on the wholesale market of electricity;

- f) The coordinating of the activities of import-export or transit of electricity and allocation of interconnection capacity according to regulations.

Transelectrica became a member of the Union for the Coordination of Transport of Electricity (UCTE) on 8 March 2003 and a member of the Association of European Operators for the transport of electricity in November 2004.

Given the structural deficit of capacity of energy produced within the Balkan countries, Transelectrica aims to transform Romania into an important area for the regional market.

Transelectrica has proved he have good relations with the transmission system operators in the neighboring countries. Maintaining the SEN interconnection with the network of the

UCTE is also one of the main strategic objectives of Romania. Therefore, strategic investment and financial efforts have been dedicated and will continue to be targeted at improving operational facilities to meet international norms and standards of UCTE.

The length of interconnection lines is about 625 km (Figure 1). The Electric network of Romania is interconnected with the networks of neighboring countries, with the exception of Republic of Moldova and Ukraine, countries that today do not meet the technical conditions specified by the UCTE interconnection.

The interconnected operation of SEN with UCTE, along with commercial advantages (related to the expansion of market energy infrastructure) and technical-economic advantages (increase safety and economical operation of the system) that provides, imposes to comply with the rules of operation and development of interconnected partners and the acceptance of monitoring certain operating performance of SEN.

Transelectrica, as a full member of UCTE, has assumed the obligations of each member of the Union, namely to comply with the technical and operational requirements. From here the current implementation of a complex program designed to identify and cover all areas of responsibility defined in accordance with the organization and operation of UCTE.

Transelectrica has adapted operating activities in accordance with the rules and regulations of the coordination of UCTE, in compliance with the requirements and procedures defined in the UCTE documents for the main branches of own activities:

- a) Programming the operation of SEN;
- b) Compensation for the unplanned exchange of power and energy;
- c) The management of forecast congestion for the next day DAF (Day Ahead Congestion Forecast);
- d) The transmission of data in the information system of UCTE;
- e) Building the ETSO node simulation calculations for the operation of interconnected systems;
- f) The congestion management, including the forecasting activity of them (Congestion Forecast);
- g) The alignment with the requirements of precision measurement and of the transmission of power exchange on the interconnection lines and of the computing cycle of the central regulator.



Figure 1. Electricity transmission network (ETN).

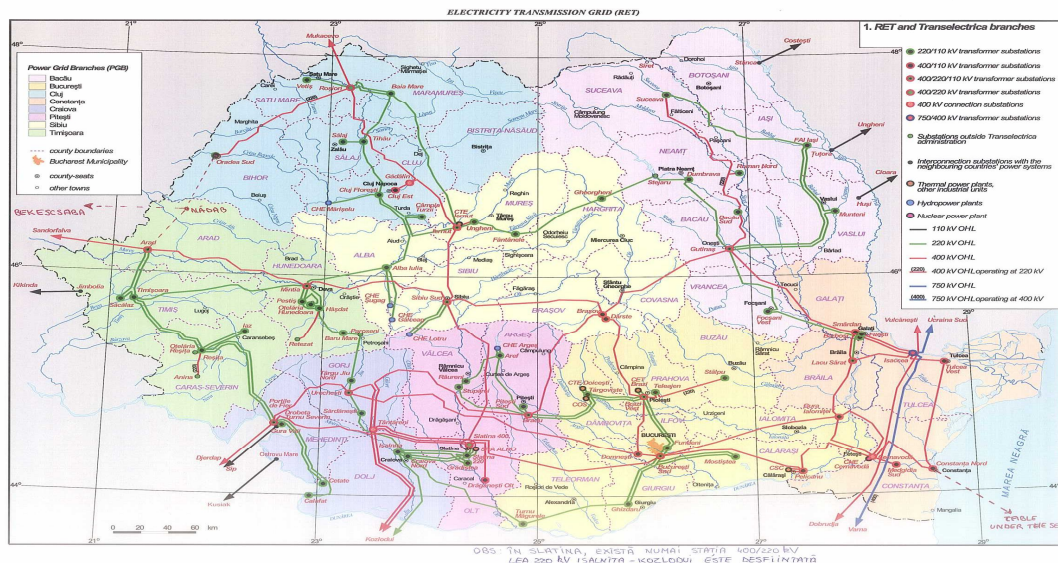
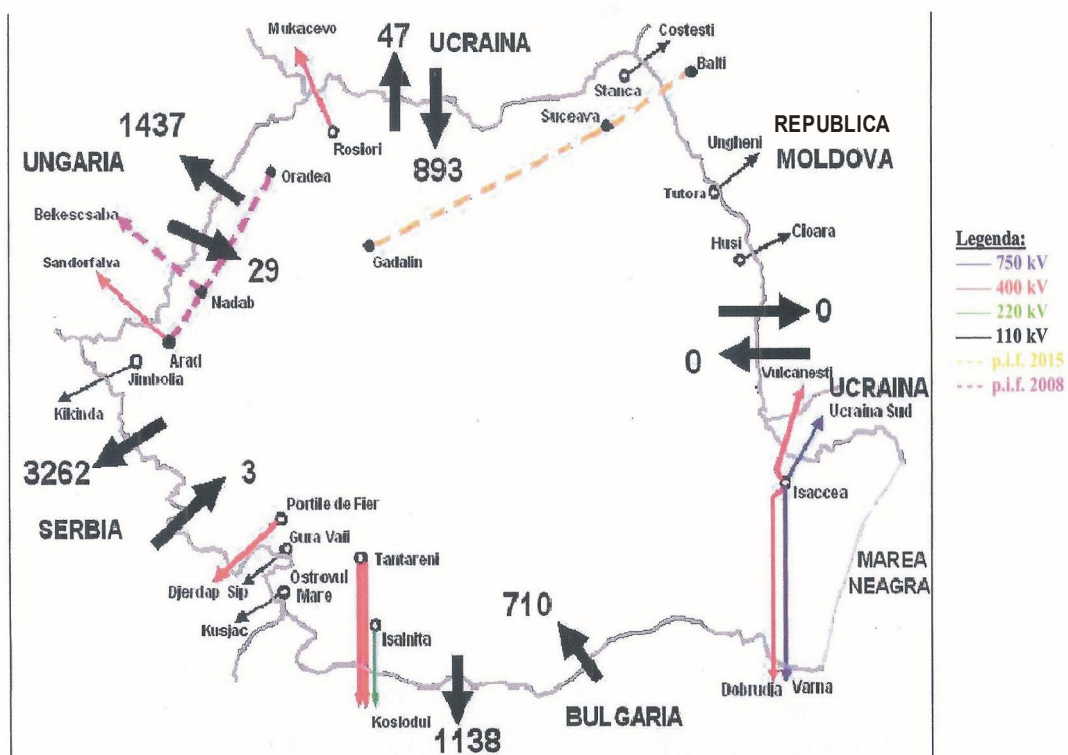


Figure 2. Electricity transmission network (ETN).  
(arrows signify the interconnection capacities with the neighboring countries of Romania in GWh).



1.3.5. Optimizing the efficiency of the national energy system:  
resources - production - transmission - distribution – consumption

The whole chain of energy (resources - production - transmission - distribution – consumption) in Romania is characterized by a low efficiency, and high energy losses for the following reasons:

- The technologies and equipment across the chain belong to the years 1960 and 1970, being morally and physically exhausted.

About 80% of the thermo generators units were installed before 1980, exceeding the normal lifetime (30 years). Most of the thermoelectric capacities do not have performant facilities to reduce noxes, so emissions of NO<sub>x</sub> and SO<sub>2</sub> standup over the maximum limits allowed in the EU.

In the last years a thermoelectric capacity of approximately 10% of the installed power has been modernized/rehabilitated. Total efficiency of the thermoelectric power plants in Romania is 15-20% lower than the thermoelectric power plants of EU countries.

As regards the hydropower units, 37% of the installed capacity have exceeded the normal lifetime. In the last years a capacity of approximately 25% of the total installed hydro power plants, representing about 900 MW, has been rehabilitated.

- The electrical distribution networks are characterized by an advanced degree of physical and moral wear of the power lines of low, medium and high voltage, including the electrical sub-stations and transformers.

The self-energy consumption of distribution networks (including commercial losses/energy unpaid or stolen) had a slight decrease, reaching in 2004 the annual average of 12.6%, compared with the EU average of 7.3%.

- The centralized district heating systems are facing a moral and physical wear of the installations and equipment, insufficient financial resources for maintenance, rehabilitation and modernization, large losses in transport and distribution, inadequate thermal insulation of existing housing fund (85 000 blocks of flats of residential sector, having 3 million apartments, in which live about 7 million people).

The best centralized heating systems (source of heat-transport-distribution-block housing) have about 35% heat losses, and the most inefficient about 77% losses, paid by the last consumer and by the social protection system. These factors have led to higher costs of production and distribution, low quality services and increased energy bill.

If in 1989 were 251 operators of centralized district heating, at the beginning of 2008 there were 104 operators, the difference representing operators that have disappeared due to financial difficulties. Although the thermal rehabilitation of buildings can reduce heat consumption by 40-50%, the lack of an effective system of financing, made that only 20 blocks have been rehabilitated, a totally insignificant figure. For comparison, after the first oil crisis of 1973, countries of Western Europe have conducted national programs of energy rehabilitation of buildings for 15-25 years, managing to reduce the consumption of heat by 60-65%. It should be noted that the EU has requested a further decrease of 22% of the heat consumption of buildings by 2012. Compared with the energy sub-sectors of electricity and natural gas, district heating sub-sector in Romania is in the most difficult situation, with a huge social impact. The disappearance of operators and the disconnections of the lodgers from the central district heating, made that today only 1.6 million apartments, and 57% of the total, remained connected to these systems.

- Nearly 69% of the total length of the National System of Transportation of natural gas has the normal operation lifetime exceeded.

Approximately 27% of the total regulating and measuring sub-stations are in operation for over 25 years. In the last years, pipes in the length of 1 964 km, representing about 24% of the total length have been upgraded/replaced. The networks for the distribution of natural gas are characterized by high wear of pipes and branching pipes, about 40% having the rated lifetime exceeded. The capacity of underground storage of natural gas has had a continuous development. Compared with 2000, when a capacity of 1 340 million m<sup>3</sup> has been stored, in 2005 in the eight existing underground deposits a quantity of 3 084 million m<sup>3</sup> has been stored.

- The National Transport system of crude oil by pipeline has a capacity of transport of about 24 million tons / year.

In 2005, the capacity of transport was used in the proportion of 54%. Since 1996, the system has entered into an extensive program of rehabilitation/modernization, completed at the end of 2006.

- The consumption of electricity is often considered a barometer of economy of a country.

In 1989, Romania had an installed power of 21 808 MW and a production of electricity of 83.6 billion kWh (taken as a reference of 100%). The subsequent economic recession was reflected in a reduction of production of electricity that had a minimum of 50.7 billion kWh (60.6%) in 1999, followed by an increase, so that in 2007 the production reached 62, 7 billion kWh (75% of 1989). As a result of the economic decline after 1989, the Romanian electricity system became overequipped, with a significant spare capacity. After the decommissioning of some units, at the end of 2007, the available power of the Romanian Energy System (SEN) was 15 369 MW, the only new capacity after 1989 being the two nuclear units at Cernavoda, 1310 MW (8.5 %).

- As it was shown above, the energy efficiency is low in the area of consumption, although an important potential to reduce energy losses (according to ARCE, 30-35% of consumption) has been identified.

The energy intensity and energy efficiency are two factors linked with each other, defining for the energy strategy of Romania, for the economic and energy sustainable development. They have a special importance for Romania, a former rich country in oil and gas, with a very weak culture of energy savings.

Energy intensity is a synthetic indicator and is the ratio of gross domestic consumption of primary energy or final energy consumption and the gross domestic product (GDP) at constant prices, expressed, for example, in toe/1000 euro. Energy intensity is an important indicator for the energy development of an economic system and for the assessment of the efficiency of energy use for a country. It depends on the structure of economy and industry and reflects the added value created by them in achieving a product.

Romania has (and has had before 1989) the highest energy intensity in Europe, which means, among other things, that has high costs to produce and consume inefficiently the energy, respectively wasting it. The main reason is a large economic share of the energy-intensive industries: metallurgy, aluminum, petrochemical, cement and construction materials, fertilizers and the export products of these industries, without a later added value by processing in the other economic sectors of the country. After 1989, the energy intensity has decreased, primarily due to the reduction of activity or shutting down of the energy-intensive enterprises.

In Romania the primary energy intensity is 0.511 toe/1000 euro2005 (3.1 times higher than the average of the EU25) and the final energy intensity is 0.385 toe/1000 euro2005, (3.3 times higher than the average of the EU25). The "National Strategy for Energy Efficiency" (2003) projected a reduction of 3% per year of the energy intensity of the whole national economy by 2020, compared to 2001.

Energy efficiency means any measure which has resulted in providing a service to a final consumer with a reduction in energy use. Energy efficiency, energy inefficiency, respectively, express how close or how far is the level in the end use of energy compared to the accepted international standards. Major sources of energy inefficiency, and losses of energy, appear in materials, apparatus, equipment, technologies, because of their low quality (heating isolation, construction materials, heat exchangers, pumps, compressors, fans, burners, thermal boilers, electrical equipment, appliances, lighting, metering, energy-intensive technologies, buildings, stolen of energy).

For a final annual consumption of energy of about 27-29 million toe/year, the savings potential is around 8-9 million toe/year, respectively savings of around 3 - 3.5 billion euros / year (for example, in reducing the energy imports bill).

**It is unanimously recognized that energy efficiency is the cheapest resource, the least polluting and most easily accessible one of all energy resources.**

The favorable factors to promoting energy efficiency in Romania are represented by the law, institutions and existing regulations, the relatively high price of energy and fuels.

The unfavorable factors (which paradoxically surpass the favorable factors) are due to the fact that the energy efficiency is disregarded, the responsible institutions are too little active, the energy efficiency programs are declarative, with no practical effect, the energy audits are formal, the penalties are not stimulating, the management is weak, the financing is very difficult, we limit ourself only to demonstration projects.

Reducing energy intensity and improving energy efficiency is a priority direction for Romania, likely to strengthen the energy security of the country, as resulting from the European Union Directives and Romania's obligations as a Member State. In particular, the adoption of the following measures is recommended:

- The energy, energy intensity and energy efficiency should be placed on the political agenda of Romania to an extent far greater than up to now, expressing the political will of Romania to promote the Lisbon objectives, the Directive 2006/32/EC on energy efficiency to the end-users, to participate actively and responsible to the general measures against global warming and climate change.

- An important medium and long term measure to reduce the energy intensity is providing and encouraging within the "Economic development strategy of Romania" (document which is missing today and which should be correlated with the strategy of the European Union) of those manufacturing industries able to increase the added value to GDP for the products of energy-intensive industries.

- The firm use, in a flat manner, well-organized of the legislative, institutional and regulations framework by updating the "National Strategy for Energy Efficiency" (2003) and other government decisions on energy efficiency (which until now had rather declarative value), by clearly establishing responsibilities and deadlines for implementation, in order to promote a real energy efficiency in Romania and to reduce unproductive bureaucracy in this area.

- The elimination of discrepancies in laws, government decisions and regulations, which in many cases have slowed down or stopped promoting energy efficiency in virtually all areas of activity.

- Strengthening and increasing the ARCE, as a government agency, in terms of powers, independence of action, specialized staffing and funds to promote energy efficiency. To encourage other funds to finance energy efficiency. Using with priority and completely the assistance grant of the European Union on energy efficiency. Greater accountability of the regulators, like ANRE and ANRSC, for better coordination and promotion of energy efficiency.

- In accordance with the provisions of Law 199/2000 on energy efficiency, the process of implementing a rigorous energy audits to the industrial consumers, public and residential buildings, should be accelerated audits certified by qualified organizers followed by recommended and implemented measures to reduce energy losses. According to Law 372/2005 on energy audit of buildings, it is mandatory for public buildings (since 2007) and private buildings (since 2010). After a year and a half no public building in Romania has complied with the legal provisions.

- Under the Action Plan for Energy Efficiency (Directive 2006/32/EC), that the European Union called on Member States in June 2007, a reduction of energy losses by 1% per year during the period of 2008-2016 is provided.

In "The First National Action Plan on energy efficiency (2007-2010)" in June 2007, Romania has proposed as interim target for 2010 the amount of 0.94 million toe energy savings, or 1.5% per year.

A practical way of identifying the sources of energy losses is the energy audits of consumers of energy, activity which unfortunately is carried out formally and with great difficulty, a major cause being the low level of penalties for default. It is considered as a justified proposal that: the penalties for failure of the energy audits to represent a much higher value.

- The conclusion of voluntary agreements on medium and long term with industrial enterprises, especially those energy-intensive, to reduce energy losses. These agreements will be mediated by the Ministry in charge and pursued by ARCE.

- The reduction of technical and commercial losses (the last due to the embezzlement and/or non-payment of energy consumed) in the distribution of electricity in urban and rural areas, by converting the distribution of electricity at low voltage to distribution of electricity at medium voltage.

- An absolute urgency is to overcome the difficulties related to financing energy efficiency, by using the methods currently used in other countries: environmental taxes (for CO<sub>2</sub> and SO<sub>2</sub>), discounts and / or tax exemptions (for the use in industry the energy efficient processes and efficient equipment), fiscal credit (through which a certain percentage of the investment for energy efficient technologies is deducted from the profit tax), tax reductions for research, development and innovation, loans with subsidized interest for investment in energy performant equipment, subsidies from the budget or ARCE to the banks and lending organizations, soft loans, etc.

- The promotion within the legal framework of the management of energy use (DSM-Demand Side Management) and energy service companies (ESCO - Energy Service Companies), and respectively the financing the energy efficiency through the third-party.

- The energy efficiency should be integrated into all social and economic activities. Using the experience of developed countries of the European Union and the obligations that Romania has in this regard, the government must redefine its role in promoting energy efficiency, moving from the stage of drafting a policy to the implementation of the policy of energy efficiency.

### 1.3.6. Energy Market

A basic principle of free market economy is the right of consumers to choose their supplier of a product and / or service.

In energy, it represents the transition from the supplier-consumer relationship specific to monopolies or oligopolies to competitive market energy relations. An important statement is linked to the fact that the market power is regarded as a powerful tool for increasing energy security of the EU as a whole and of any individual Member State, in part.

The EU has practically started the liberalization of electricity and natural gas markets in 1996-1997. In 2003, two new directives were adopted that accelerated the liberalization process and the formation of an internal market for European energy. The report of the European Commission on the implementation of the internal market, addressed to the Council and European Parliament at the end of 2005, highlights the need to continue the separation of vertically integrated activities, to strengthen the capacity and independence of the regulators, the construction of additional interconnection capacities, and the promotion of measures for better functioning of competitive markets for electricity and natural gas. The fact that prices for industrial consumers of electricity varies between different EU states from simple to double and that the trade in electricity between the countries have reached only 10.7% of consumption, clearly reflects that the process of creating the single market is far from being concluded. At the Member State level, it reflects the degree of concentration of production, manifested by the existence of more than three operators.

If in the electricity domain, three producers have on average half of the market, on the natural gas market the degree of concentration is over 70%. This trend of concentration seems to continue, which is the reason why the European Commission in 2005 started an investigation on compliance with the competition rules, the investigation whose results were expected by the end of 2006.

In Romania, the creation a functioning energy market was based on:

- the restructuring of the energy sector, by separating the activities of generation, transport, distribution and supply;
- the market liberalization through the free access to the transport and distribution networks, correlated with the eligibility of consumers, thereby encouraging the competition in the supply and production;
- the implementation of a consistent and transparent legislative and energy trading framework,
- the transposition of the Directive 2003/54/EC on common rules for the internal market in electricity and of the Directive 2003/55/EC on the common rules of the internal natural gas market.

**Electricity market.** Romania has chosen the model of the decentralized electricity market, where the generators and the suppliers are free to enter into transactions of sales of electricity. The market model is based mainly on the development of bilateral contractual relationships between generators and suppliers, with a gradual reduction of regulator intervention in the competitive segment. The relations between the market participants are

based on contracts that can be bilaterally negotiated or regulated. The regulation of activities of natural monopoly (the transmission and distribution) was done on the principles of transparency, non-discriminatory access to the network and recognition of the justified costs. Since 2005, the regulated tariffs for the use of the networks are based on the ceiling type methodologies. The present stage is meeting the international requirements in the field, making possible to integrate the national market of electricity in to the regional and European level.

Until the total opening, the market of electricity was composed of the regulated market and the competitive market. In the competitive market the price is formed freely, based on supply and demand. On the regulated market, the prices and tariffs were established by ANRE on their own methodologies.

Since July 2007, all consumers, became eligible, which corresponds to a degree of electricity market opening of 100%.

The electricity market has expanded and improved through the introduction of four new trading platforms:

- The next day Market;
- Balancing Market;
- Centralized Market of Bilateral Contracts;
- Centralized market of Green Certificates.

This model is adopted by most European countries. Romania is the only country in the region as organizer of a market for the next day and of a functional balancing market. The stimulation of the generation of electricity from renewable sources is achieved through Green Certificates traded on the competitive market of Green Certificates, and by mandatory quotas for suppliers. Each supplier is required to purchase an annual quantity of Green Certificates, proportional to the amount of electric energy sold to consumers by the respective supplier.

**Natural gas market** was made up of: a competitive segment, which included the trading of natural gas between suppliers and between suppliers and eligible consumers; in the competitive segment the prices are formed freely, based on supply and demand; the regulated segment, which encompassed the activities of natural monopoly and supply at regulated prices and under the framework contracts; in the regulated segment of the market, the prices and tariffs were set by ANRGN, based on their own methodologies.

The activities of the regulated segment include: natural gas supply at regulated prices and in the framework contracts to customers, the management of commercial contracts and contractual balance of the internal market, the transport of natural gas, the underground storage of natural gas, the natural gas distribution, the natural gas transit except for the transit through main dedicated pipelines (this transit is subject to the conditions established by international agreements under which they were made).

In order to ensure an organized framework for an fairly and non-discriminatory allocation of natural gas from domestic production and from imports the Market Operator has been set up and operates, organized under the Bucharest National Dispatch of Natural Gas the structure of Transgaz SA Medias.

The natural gas market in Romania was gradually opened since 2001; in 2005, the degree of natural gas market opening was set at 50% of total consumption. Since 01.01.2006, the opening of the internal market of natural gas was 65% of total domestic consumption and from 01.07.2006 the degree of market opening has increased to 75% of total domestic consumption. Since 01.07.2007 the degree of market openness was 100%.

In order to ensure the necessary consumption of all categories of consumers and to eliminate the disfunctions arising in the domestic natural gas market during the winter 2005-

2006 (due to exterior low temperatures and to the reduction of natural gas imported in January and February 2006), the Romanian government has approved the promotion of the concept of the interruptable consumer, in order to achieve security in the supply of natural gas in accordance with the European Council Directive 2004/67/EC, and the allocation, in a non-discriminatory manner, of the quantities of natural gas to all industrial consumers who accept the status of the interruptable consumer. The interruptable consumer represents that consumer who contributes decisively to maintaining the safe functioning of the National System of Transport and of natural gas distribution systems, by accepting to reduce its consumption, up to stopping, in accordance with the European Council Directive 2004/67/EC, in order to protect the supply of households.

Relative to the model for restructuring of the energy sector and the market model adopted in Romania one can make number of observations related to some disfunctions, affecting both their economic performances and the energy security of the country. Thus:

- The model of restructuring and the market model initiated in 1998 in the former Autonomous Regie of Electricity RENEL and namely the competition in energy production and supply, with third party regulated access to the network, have proved later to be correct choices, in accordance with the EU energy policy, placing Romania in a very good position among countries in South-Eastern Europe.

The appearance of the three separate producers (thermal, hydro and nuclear), with problems and very different prices of energy, was due to various reasons: the separation of the nuclear generator has been expressly requested by the World Bank, and the separation of thermal and hydro producers was due to avoid the subsidization by "communicating vessels" of the a thermoelectric power plants by the hydroelectric ones. Although the model of restructuring of the energy generation side was considered subsequently imperfect, it was found to be "convenient", so that over the next 10 years no significant changes in structure or in terms of privatization has been brought.

The gradual opening of electricity market has naturally led to the sale with priority of the cheaper energy (especially hydro and energy produced from lignite), but with many items of questionable legality. One appeared so, a number of companies supplying large quantities of electricity and having long term contracts, which, according to the official warnings and information from the press, have enjoyed political protection, achieving undeserved profits and creating large discriminations against the equal treatment of the participants in the market. Reports made have had no practical relevant results.

In the context of the privatization of the generation sector has not started yet, there are large reserves related to fair competition between different companies producing energy, all with the same owner, the state.

For some of these companies (for example, Termoelectrica), the accumulated debts have been periodically removed to the public debt. In the same context, it is criticized by the European Union, World Bank, trade unions and professional associations in Romania, the government's intention to establish a National Company, which includes major producers and distribution companies non-privatized yet, with a market share of over 40%.

Energy markets has a number of disfunctions, which manifest themselves or can manifest themselves by low transparency, irregularities in the transactions, abuses or excessive market power.

In this sense, "The Romanian Energy Program, Phase 3 (REP3) sponsored by USAID for the Government of Romania between 2005 and 2007, to avoid those reported above, proposed the establishment of an independent Office of monitoring and surveillance of energy



(market controller). This Office will monitor in real-time the events and market structure, and further analysis of transactions too, to identify any irregularities.

## **2. “Green energy” – component of energy strategy**

### **2.1. Romania and „green energy”**

#### **2.1.1. Guidelines for Romania**

Romania expressed its support for strengthening the role of the European Union as the world leader in combating climate change (of anthropogenic nature). EU leaders endorsed this vision in March 2007. They committed the EU to cutting its greenhouse gas emissions by 30% of 1990 levels by 2020 provided other developed countries commit to making comparable reductions under a global agreement. And to start transforming Europe into a highly energy-efficient, low-carbon economy, they committed to cutting emissions by at least 20% independently of what other countries decide to do.

In this way, Romania has shown support to the concept of sustainable development – the use of renewable sources contributing to reducing the impact of energy on the environment.

Romania has an important potential of renewable sources which offers unlimited availabilities to be used locally and nationally but insufficiently turned to account, due to the high costs necessary to achieve a functional infrastructure.

The promotion of renewable energy sources can be achieved on the basis of three premises namely *affordability, availability and acceptability*. Romania must reduce the dependence on imports of classic energy resources the more so as “The Energy Strategy 2007-2020” warns about the risk of an important increase in Romania’s dependence on energy imports from 35-40% presently to 60% in 2015, if the structure (dominated by hydrocarbons) and dynamics of current energy consumption are maintained.

#### **Reducing emissions of greenhouse gases.**

The target of reducing greenhouse gas emissions in Romania was set at a rate of +19% compared to 2005 for non-ETS sectors (transport, agriculture, waste, services, housing, heating, small installations not subject to Trading Scheme) given that, during 2001-2005 period, our country has voluntarily reduced the pollutant emissions by 35% . This result placed it on fifth position in the rank of EU countries. The way Romania will turn to account the "advantage" of 19% will depend on the degree to which the development of services sector and small and medium enterprises will contribute to GDP growth.

#### **Strategic goals and targets in the promotion of renewable sources in Romania.**

The key targets regarding the reduction of greenhouse gases emissions, the renewable energies, energy efficiency, biofuels are approached by separate directives, but one must take into account the interdependence between them, the more so as national strategies does not provide specific monitoring indicators on greenhouse gas emissions.

- ***Romania’s potential of renewable energy sources***

**Solar energy:** the energy contribution of solar-thermal systems to the necessary heat and domestic warm water is estimated at **1,434 million toe (60 PJ/year)**, which could substitute about 50% from the domestic warm water or 15% from the thermal energy for current heating. The manageable/ exploitable potential of electricity production by photo-voltaic systems amounted to **1,200 GWh /year**.

**Weak Points:** There are some demonstrative projects, a relevant potential, but there are neither specific targets nor regulations for upholding them.

**Wind energy:** on short and medium term the wind energy potential reached about **2000 MW**, with an average electricity output of **4,500 GWh/year**. Turning to account the wind energy

potential, under efficiency conditions, implies the use of appropriate technologies and equipments.

**Weak points:** The big installations connected to the national electricity system are still missing.

Table 5. Romania's potential of renewable energy sources

Source	Annual potential	Application
Solar energy	60 PJ	Thermal energy
Wind energy	1,2-2 TJ	Electric power
Hydropower, of which	40 TWh	Electric power
Under 10 MW	6 TWh	Electric power
Biomass	318 PJ	Thermal energy Electric power
Geothermal energy	7 PJ	Thermal energy

Source: Energy Strategy of Romania, 2007-2020

**Hydropower:** the hydropower potential of the main rivers is of **40,000 GWh/year (34,000 GWh/year** – big hydropower units and **6,000 GWh/year**- small hydropower units). The new capacities' projects for 2003-2015 period have been estimated at **500-900 MW**.

**Weak points:** There are not specific stimulation mechanisms for the fulfilment of hydropower projects.

**Biomass:** Romania has a high energy potential of biomass, estimated at **7594 x 10<sup>4</sup> toe/year (318 PJ/year)**, accounting for 19% of the entire consumption of primary energy sources in the year 2000. About 54% of the heat produced from biomass is obtained as a result of burning biomass from cellulose; 89% from the heat used in household heating and cooking (in rural area) proceeds from vegetal wastes and residues.

**Weak points:** despite the existing conditions for developing these sources, they are only in the shape of general objectives.

**Geothermal energy:** the reserves of geothermal energy, potentially exploitable are estimated at **167,000 toe (7 PJ/year)**.

#### **Action guidelines:**

#### **1. Romania's integration into the European concept of promoting biofuels and biomass use**

- Identification of best practices to promote biofuels utilization both for transport and in specific areas such as the agriculture mechanization;
  - Identification of mechanisms to stimulate the production of feedstocks (energy crops) by: providing facilities to the farmers for the cultivation of energy crops (in line with the EU specifications), allowing incentives for agricultural crop and forestry residues collection;
  - Identification and improvement of specific technologies for the entire chain of biofuels production, by:
    - Production of rape varieties resistant to low temperatures;
    - Development of efficient energy crops to produce bio-ethanol (sweet sorghum, topinambur, switchgrass, energy willow, miscanthus, etc.).
    - Promotion of technologies for collecting crop and forestry residues;
    - Implementation of modern technologies for biofuels production including the second-generation ones;
    - Drawing up criteria for biofuels utilization;
    - Implementing the technical requirements necessary to facilities that use biofuels.
- identification of best practices to stimulate demand for biofuels;
  - cost-benefit analysis on the use of biomass and biofuels;

- c. stimulating measures for biofuels producers and development of domestic sales, inclusively by fiscal measures;
- d. drawing up scenarios to stimulate use of biomass in order to obtain bio-liquids and biofuels for transport, electricity and heating.

*Results:*

- Increased use of biofuels and bio-liquids;
- Reducing dependence on any one source of imported energy,
- Efficient utilization of biomass;
- Employment increase ;
- New revenue opportunities in rural areas.

## **2. Assessing the impact of using blendings of biofuels and conventional (petroleum) fuels**

*Specific objectives*

- Identifying an optimum percentage of biofuels to be blended with diesel or gasoline for non-adapted engines, including those used in agriculture;
- Assessment of biofuels (blended with fossil fuels) influence on non-adapted engines performance;
- Carrying out actions that will lead to increased use of biomass in order to obtain biofuels for transport, electricity and heating.

*Results:*

- Reducing the impact generated by the use of fuels and conventional energy sources on environment and people health;
- Reducing dependence on conventional fuels;
- Reduction of gas emissions that cause greenhouse effect;
- Different types of incentives for people buying cars running on biofuels blended with fossil fuels.

## **3. Assessing the supply of raw materials**

*Specific objectives:*

- Tracking the incidence of demand for biofuels on the market prices of products and by-products and availabilities for competing industries, as well as the impact on the supply and prices of foodstuffs in EU and developing countries;
- Information campaigns for farmers and forestry operators on energy crop benefits and the opportunities they offer;
- Developing an action plan in forestry field emphasizing the importance of using forestry materials and residues for energy purposes;
- Re-examination and modification of legislation relating to food by-products in order to facilitate authorization and approval of substitution processes for biofuels production.

*Results:*

- Development of technological platforms for biofuels in the main areas: agriculture industry, food industry, biofuels sector, oil companies and fuel distributors, manufacturers in the technical field, research bodies;
- Creating conditions for the production of biofuels from second generation.

In addition we can add the following general objectives set by Romania's energy strategy for the period 2007-2020:

- integration of renewable energy sources in the national energy system;
- mitigation of technical-functional and psycho-social barriers in the promotion of renewable energy sources, simultaneously with the identification of cost and economic efficiency elements;
- promoting private investment and creating conditions to facilitate access of foreign capital on the renewable energy market;

- ensuring the independence of the energy consumption of the national economy;
- ensuring energy deliveries to isolated communities by turning to account local potential of renewable sources;
- creating conditions for Romania's participation in the European market for "green certificates" for energy from renewable sources.
- Better utilization of the renewable energy sources potential from isolated geographic areas or with limited access to National Transport System, including residues collected on disabled land or removed from the agricultural circulation.

**General Targets for Romania regarding renewable energy sources (SRE):**

To underpin these commitments, Romania set three key targets to be met by 2020:

➤ **Increase of renewable sources' share (solar, wind, hydro, geothermal, biogas, etc.) in total consumption of primary energy, from 17.8% in 2005 to 24% in 2020** (compared with EU average, where SRE' share will grow from 8.5% in 2005 to 20% in 2020).

Romania has the obligation, until 31 March 2010, to develop and submit to the European Commission a National Plan of Action on renewable sources, with targets, timetables for implementation and precise responsibilities on electricity, heating and cooling and transportation fields.

EU legislative package on climate and renewable let each Member State a certain autonomy of decision on the following aspects: a) the optimal choice of renewable sources' mix; b) the allocation of efforts in the 3 sectors (electricity, heating, transport), in order to achieve the national target; c) choosing the best methods to achieve goals, depending on the situation and the national potential; d) the opportunity to use the provision relating to the transferability of guarantees of origin -which implies that countries that do not have the resources necessary to manufacture biofuels for transport will be allowed to import them.

➤ **An increase to 5.75%, until the end of 2010, and to 10% until 2020, in the share of petrol and diesel consumption from sustainably-produced biofuels.** This equals to a need for biodiesel and bioethanol of about 340 000 tonnes/ year for 2010 and of 600.000 tonnes / year by the end of 2020. The amounts are calculated on the basis of gasoline and diesel consumption in 2006. While the target set for 2010 is an indicative and non compulsory one, the target for 2020, is binding and involves the development of biofuels of second generation.

In order to be sure that all biofuels necessary to achieve the 10% target are produced in a sustainable manner, European Commission pledged itself – in the Roadmap for renewable sources –, to define strict criteria for environmental sustainability. Romania, as an EU member state with full rights and obligations adapted its legislation to the Commission Directives on biofuels, issuing also a secondary legislation necessary to fulfill its tasks. In 2007, the Romanian Government approved a series of amendments and additions to the Government Decision (GD) 1844/2005 with the view to promote biofuels and other renewable fuels for transport and to phase out their introduction up to 2009, in four stages. The share of biofuels blended with conventional fuels, are as follows:

- from 1 July 2007 - diesel with a biofuel content of min. 2% of the volume;
- from 1 January 2008 - diesel with a biofuel content of min. 3% of the volume;
- from 1 July 2008 - diesel with a biofuel content of min. 4% of the volume;
- from 1 July 2009 - gasoline with a biofuel content of min. 4% of the volume.

➤ The **national targets** concerning the share of electricity produced from renewable sources (E-SRE) in gross national consumption of electricity (including large hydro), adjusted according to EU Directives, based on GD no.1892/2004 issued on the basis of GD No. 443/2003 have the following values:

- 33% in 2010, with large hydro-21, 4 TWh (target increased from 30%, according to Directive 2001/77/EC);
- 35% in 2015;

-38% in 2020.

As for the electricity from renewable sources, Romania has achieved the target. In 2004, most of the amount of electricity produced from renewable (SRE-E) was generated by large hydro. In large measure, the high potential micro-hydropower plants remained unexploited. During 1997-2004, both the production of most renewable and the pace of growth have been stable.

#### 2.1.2. Tools for promoting renewable sources

The main programs issued in Romania with the view to ensure the achievement of objectives relating to the sustainable development of energy sources, by stimulating renewable sources are:

- The National Development Plan 2007 - 2013;
- The National Strategic Reference Frame 2007 - 2013;
- The National Program of Reforms;
- The Energy Strategy of Romania 2007-2020;
- The Strategy for promoting renewable energy resources (2003).

**Instruments to promote** renewable energy sources are represented by a series of national programs (National Action Plan on Energy Efficiency 2007-2010, National Program for Rural Development, 2007-2013, the Sectoral Operational Program (SOP).

Under the *institutional aspect*, the ministries with direct responsibilities in promoting renewable resources and environmental impact are the Ministry of Economy and Finance, with its subordinate agencies and the Ministry of Environment and Sustainable Development, but other ministries and regulatory agencies were involved too in transposing into practice the projects related to renewable sources promotion: the Ministry of Agriculture and Rural Development, the Ministry of Education, Research and Youth, the Ministry of Transport, ANRE.

The *National Reform Program* developed by the Romanian Government in 2007 refers to the effective use of renewable and non-renewable resources and the biodiversity protection as priority objectives for Romania.

The *Strategy for turning to account the renewable energy sources* promotes "clean" energy use (wind, solar, biomass, hydro, etc.) for heating and electricity production, the integration of renewable sources into the National Energy System and establishes the conditions for the participation of Romania in the European market of green certificates.

Sectoral Operational Program, "Increasing economic competitiveness" (SOP-ECA), in the Priority Axis 4, "Increased energy efficiency and security of supply, in the context of combating climate change", major field of intervention 4.2, has set as objective the development and use of renewable energy resources particularly in new thermal power plants.

Sectoral Operational Program for Transport, the Priority Axis 4, sub-objective 4.3, "Minimizing adverse effects of transport on the environment" includes measures to promote use of biofuels.

The first *National Plan of Action on energy efficiency 2007-2010*, adopted at the end of 2007, provides the promotion of biofuels' use in the transport sector, as an energy saving measure and details the financial instruments to support the indirect development of biofuels production.

The main purpose of the *National Program for Rural Development, 2007-2013 (PNADR)*, prepared by the Ministry of Agriculture and Rural Development is inter alia, to support and develop investments for the production and processing of biomass in order to obtain biofuels, implicitly by means of European funds. In the Axis 1, "Increased competitiveness of agriculture and forestry sectors," by the measure "Modernization of agricultural holdings", producers of biofuels can access EU funds for the procurement of equipment and machinery for biomass / biofuels production in the farms; by another measure

entitled "Increase of added value of agricultural and forestry products" the program will support SMEs operating in rural areas and, by providing that as first -processors of agricultural and forestry products they can purchase too, the equipment for the production of biofuel. In the Axis 3, "Quality of life in rural areas and diversify the rural economy", the measure "Support for the diversification of non-agricultural activities, creation and development of microenterprises", SMEs will support integrated processing (first and secondary processing) of agricultural and forestry products as well as the microenterprises involved in the secondary manufacture of biofuels.

The *National plan of action on climate change for the period 2005-2007* (PNASC), drawn up for the implementation of the "National Strategy on Climate Change (SNSC), has proposed in the subchapter 6.2., an objective referring to the "Promotion of energy production from renewable sources." But the actions identified in PNASC cover only the period until 2007, while Romania's target regarding the share of renewable energy will require longstanding efforts. Under these circumstances, the only viable actions consist in intensifying Romania's participation in the *Intelligent Energy for Europe* (subchapter.6.1. PNASC of)-an aid program for community non-technological actions in energy efficiency and renewable energy sources fields - focused on assessing the possibilities of increased co-financing and the introduction of new financial mechanisms for renewable energy projects.

The *National Program for reducing energy costs for households through increased energy efficiency and renewable energy use, 2007*, provides actions of unredeemable co-financing through transfers to local budgets for the use of renewable energy resources: solar energy, geothermal, energy from biomass, other wood residues, warming pumps – in the present termofication system and/or new termofication system.

#### ***Financing sources***

The main tools/mechanisms of financial support to renewable energy sources are as follows:

- a) direct support schemes of prices, by means of which the energy producer receives, on a national regulation basis, financial assistance directly or indirectly (for the energy produced);
- b) aid for capital investment - consists of grants for capital investment or loans for equipment.
- c) aid for the research and development sector which promotes exclusively, renewable energy sources;
- d) an indirect aid for the production of energy from renewable sources- is granted for the implementation of programs for reforestation, fast-growing crops, use of biofuels from biomass;
- e) fiscal measures consisting in: exemption or reimbursement of energy taxes, reducing the rate of VAT to certain types of energy from renewable sources; tax exemptions on investments in micro energy power plants using renewable sources.

In the case of biofuels for transport, the main measures of financial support are summarized in the "National Action Plan on energy efficiency 2007-2010", Chapter III.3.4, "Promoting the use of biofuels for transport".

The Ministry of Economy and Finance has proposed as a fiscal incentive, total exemption from excise duty for producers of all categories of biofuels, including biomass. The Fiscal Code, which came into force on 1 January 2007 has validated this proposal, but the Fiscal Code for 2008 abolished these exemptions.

The Ministry of Agriculture and Rural Development (MARD) initiated a program of priority actions to support farmers growing energy crops. Financial support is ensured from the state budget, within the approved budget of MARD for 2007 and 2008 years. MARD granted a subsidy of 45 euros per hectare from European funds, plus a complementary financial support of about 33 euro/year from the national budget. In addition, MARD has

stimulated the production of biofuels with more tools targeted to stimulate specific crops - subsidies for technical crops and for the fuel used for seasonal agricultural works.

European funds are an important source of financial support for biofuels which can be accessed through the **European Fund for Agriculture and Rural Development (EFARD)**. EFARD is an European post –accession fund unlike the SAPARD program, which is an EU pre-accession fund.

Investments in agricultural crops for biodiesel production and investments in facilities for the production of biodiesel fuel, stipulated in the National Program for Rural Development, 2007-2013, Axis 1 - "Increased competitiveness of the agricultural sector and forestry" will be eligible for grants through EFARD. The maximum amount of grant funding for the two types of investments referred to has not been exactly determined but it is possible that the maximum amount of grant to start from 500,000 euros for the farms and to reach up to 2 million euros for the processing sector. These amounts cannot exceed, however, 50% of the total investment, excluding VAT and other taxes, which will be borne only by the beneficiary who will recover them from the state.

In 2007, according to the applications registered at The Agency of Payments and Intervention in Agriculture the amount of arable land area for energy crops eligible to receive financial support from the EU was about 148,300 hectares, which represents about 1.6% of the arable land of the country and about 11.8% of the sunflower, rape and soybeans surfaces harvested in 2007.

Final area eligible for payment can support changes according to the delivery reports of quantities stipulated in contracts. For these energy crops there is a payment scheme which also includes an aid from the European Union amounting to 45 euros / ha in the limit of 2 million/ha at Community level. After centralizing the data transmitted by Member States at the end of 2007, cultivated area at EU level was over 2.8 million ha. This aid scheme help fill the financial support to farmers through the Single payment scheme related to the surface (SAPS) and the National complementary payments scheme.

Beneficiaries of the scheme of direct payments on the surface are those who have opted for this scheme through applications at territorial branches of the Agency of Payments and Interventions for Agriculture and concluded a contract for delivery of products to a collector, first-processor or producer of biofuels.

The source of financing for payments under the scheme of direct payments related to the surface for energy crops is provided by the European Fund for Agricultural Guarantee (EFAG). The single payment scheme related to the surface is financed by EFAG while the financing sources for the scheme of national complementary payments are EFARD and the national budget.

From the data transmitted through a infograma in April 2008, it results that in the Commissioner for agriculture' opinion, biofuels can be one of the solutions against the effects of climate change and an option for providing energy in the future. To achieve the proposed targets, namely the 10% renewable energy in total consumption of fuel in the transport sector, it is expected that in 2020 approximately 15% of the arable land of the EU will be earmarked to biofuels production. Also, according to estimates, prices for cereals will increase by 3-6%, while those for rape oil will increase by 6-8%. Both of them are deemed acceptable at Community level.

At the European Council of 19-20 June 2008, Romania has proposed gradual elimination of subsidies to crops for the production of biofuels and their substitution with measures aimed at promoting capital investment (including state aid) in equipments and productivity increase in agriculture.

In response to the post-accession tasks, Romania has established technological platforms for biofuels (BIOCARO) similarly to those existing in EU, whose mission is to help develop technologies for the production of biofuels, in conditions of maximum economic efficiency economic to create a strong biofuels industry and accelerate their development in

Romania by targeting priorities towards stimulating research in the field as well as by promotional activities and demonstrations.

In order to promote the production of electricity from renewable energy sources in Romania, Government Decision No 1892/2004 ("GD1"), as amended by Government Decision No 958/2005, established a **mechanism for promoting the production of electricity from renewable energy sources**, consisting in an obligatory quota system, combined with a green certificates trading system. The promotion mechanism provides E-RES producers with an additional income, via a green certificate (GC), for each megawatt of electricity supplied to the electricity grid. Green certificates granted to producers may be exchanged in a competitive system, either on the centralised green certificates market or on the bilateral contracts market. The price for exchanging a GC should fall within the price limits set by the Government, which are EUR 24 - 42/GC for transactions carried out by 2012.

To ensure the functioning of GC markets and the stimulation of demand on the markets, under the adopted promotion mechanism, annual obligatory quotas have been established until 2012 for acquisitions of GCs by suppliers of electricity to final consumers. These quotas ensure that the national target laid down by Directive 2006/108/EC is met.

The mechanism for promoting E-RES adopted in Romania applies to electricity produced from wind energy, solar energy, geothermal energy, biomass, wave energy, and electricity produced in hydroelectric power station with an installed power less than or equal to 10 MW that have been put into operation or modernised since 2004.

The annual obligatory quotas set for the acquisition of GCs and imposed on suppliers of electricity to final consumers are as follows for the period 2005-2012: 0.7% for 2005, 2.22% for 2006, 3.74% for 2007, 5.26% for 2008, 6.78% for 2009 and 8.3% for the period 2010-2012

Article 5 of Directive 2001/77/EC on the promotion of E-RES makes provision for the certification of the origin of electricity produced from renewable sources. EU Member States were required to implement a system of certificates of origin for E-RES not later than 27 October 2003.

In Romania, Directive 2001/77/EC was transposed into national legislation via Government Decision No 443/2003 on the promotion of electricity production from renewable energy sources, as amended. The system of certificates of origin for E-RES was detailed in Government Decision No 1429/2004 approving the Rules for certifying the origin of electricity produced from renewable energy sources. The Rules stipulate that the state authority responsible for issuing and monitoring Guarantees of Origin (hereinafter "GO") is the National Energy Regulation Authority (ANRE).

Guarantees of origin must contain the following information at least:

- the energy source from which the electricity was produced, indicating the date and place of production, and, in the case of hydroelectric stations, the installed power of the facility;
- information enabling producers of electricity from renewable energy sources to demonstrate that the electricity they are selling is indeed produced from renewable energy sources.

Guarantees of origin are used for the following purposes:

- to determine and demonstrate the proportion of electricity produced from renewable energy sources in the energy produced and the energy corresponding to final consumption;
- to monitor the meeting of the national target for the proportion of electricity produced from renewable energy sources in gross national electricity consumption;
- to enable producers to access systems for the promotion of electricity produced from renewable energy sources.

In Romania, guarantees of origin are issued solely for statistical purposes and to establish the extent to which the national targets have been met. They do not have any market

Experience gained from the implementation of the adopted package of measures on energy and climate change, published by the European Commission in January 2008, Romania's Energy Strategy for the period 2007-2020, and signals transmitted from



participants to green certificates' market suggest the need to improve the existing system for promoting E-SRE, by increasing its transparency, facilitating the proper application and increasing its attractiveness to potential investors.

The *Administration Fund for the Environment*, operating under the coordination of the Ministry of Environment and Water Management is financing projects supporting renewable energy sources (wind, solar, geothermal, biomass, hydropower). The amount of financing ranges between 14,000 and 5.7 million. The unredeemable financing may cover 30% of eligible project costs for commercial companies, 40% for small and medium enterprises and for projects involving energy recovery and 60% for public authorities.

Economic operators who wish to obtain funds for investment in this segment, for the purchase of equipment used in primary processing can call on the structural funds. Another source for co-financing projects of grant-type is **the EU Green Fund**, which can cover up to half of the projects' capital costs for generating electricity.

**The Regional State Aid Scheme for turning to account renewable energy resources**, approved by the Government (GD of 9 July 2008) has for an object to support the financing of economic operators in view to turn to account renewable energy sources, less biofuel. The scheme is exempted from the requirement of notification to the European Commission. The maximum amount of state aid, which may be granted to the beneficiaries is 40% -50% of the investments eligible costs, for small businesses the bonus that can be granted is of 20% and for the medium ones of 10%. The budget is composed mainly of European funds provided by EFRD grants, the rest being provided by the state budget.

Unlike E-SRE, Romania does not have a coherent framework to promote investment in projects using renewable sources to produce heat.

### 2.1.3. Development of feedstocks for biofuels production

Biofuels are produced from organic, biological materials. Theoretically, biofuels can be produced from any (biological) carbon source, although, the most common sources are photosynthetic plants. Various plants and plant-derived materials are used for biofuel manufacturing. Agrofuels are biofuels which are produced from specific crops, rather than from waste processes such as landfill off-gassing or recycled vegetable oil.

There are two common strategies of producing agrofuels. One is to grow crops high in sugar (sugar cane, sugar beet, and sweet sorghum) or starch (corn/maize), and then use yeast fermentation to produce ethanol. The second is to grow plants that contain high amounts of vegetable oil, such as oil palm, soybean etc. When these oils are heated, their viscosity is reduced, and they can be burned directly in a diesel engine, or they can be chemically processed to produce fuels such as biodiesel.

Supporters of biofuels claim that a more viable solution is to increase political and industrial support second-generation biofuel implementation from non food crops, including cellulosic biofuels. Second-generation biofuel production processes can use a variety of non food crops. These include waste biomass, the stalks of wheat, corn, wood, and special-energy-or-biomass crops.

The agricultural potential of Romania (14.7 million hectares of agricultural land of which 9.4 million ha of arable land) can ensure the supply of feedstoks for the production of significant quantities of biofuels. Thus, areas that can be planted with oil (producing) plants in an agricultural year, in accordance with the good agricultural practices and environmental conditions may be about 900 thousand hectares of sunflower, about 500 thousand hectares of rape and about 150 thousand ha of soybean. Total area of these crops is about 16.5% of the arable area of the country.

Taking into account the average output from energy crops, which can be obtained in the normal agricultural years (no drought, frost or other calamities) the annual production of oilseeds resulted is about 2.6 million tons. Depending on the efficiency of extraction

processes (41.5% to sunflower seeds, 35% for rape seed and 17.5% for the soybean seeds) the production of vegetable oil that can be obtained is about one million tons.

The feedstocks for biofuels are vegetable oils and biomass. According to statistical data, about 300 thousand tons of vegetable oil are used for food, which means that the other 700 thousand tons oil can be processed to obtain biodiesel from the first generation.

In addition, in Romania there are important areas of corn crops (about 2.5 million hectares annually). From the quantities produced (over 10 million tons) an important part may be used to obtain bioethanol. There are also projects of factories for bioethanol production from sweet sorghum or sugar beet.

In Romania too there is a considerable energy potential derived from biomass of about 7600 thousand tons of oil equivalent/year. The physical potential of biomass is of 2.6 million tonnes. A better turning to account of this huge potential, can be obtained when second-generation biofuel production processes and technologies will be commercially available. These technologies use non food crops, including cellulosic biofuels.

*The main energy crops* in Romania are as follows: for *biodiesel*: rapeseed, sunflower and soybean, for *biogasoline*: sugar beet, grains, sugar sorghum; for *biogas*: manure, livestock, corn, agro-industrial waste; *solid fuel*: wood crops.

Among all other raw materials, biomass has a special relevance, mainly because it is an important source of fixed carbon, a renewable energy source based on the carbon cycle, unlike other natural resources such as petroleum, coal, and nuclear fuels.

A lot of types of biofuels such as biogas, biomethanol, other derivatives obtained from biomethanol, can be extracted from biomass.

As main sources of biomass one can mention: a) agricultural products specifically grown for biofuel production including corn, switchgrass, soybeans; rapeseed, wheat and sugar beet; b) biodegradable outputs/wastes from industry, agriculture, forestry and households (straw, liquid and dried manure, sawdust, etc). The forestry and agricultural residues are including: firewood (15.5%), sawdust and other wood residues (6.4%), residues from agriculture (63.2%), household wastes (7.2%) and biogas (7.7%).

#### 2.1.4. The production of biofuels. Producing companies producing and investments

**Biofuels** are liquid or gaseous fuels used for transport being available in several forms, among which the most common are: **bioethanol** - ethanol produced from biomass and / or biodegradable fraction of waste; **biodiesel** - methyl ester produced from vegetable or animal oils; **biogas** - gas fuel produced from biomass and/or the biodegradable waste that can be purified to reach the quality of natural gas, to be used as biofuel or wood gas; **biomethanol** - methanol produced from biomass, to be used as biofuel. Biodiesel is the most important biofuel due to a long series of advantages.

The production of biofuels is influenced by a number of factors including: the oil price, the production policies, the size of domestic and regional market, the amount of investments in infrastructure, the political support of state, the opportunities for export and the competitiveness of feedstocks for biofuels.

Biofuels can be used today in standard vehicle engines (non-adapted for using biofuels in low blends with petrol and diesel) or in vehicles engines slightly adjusted for biofuels blends of 10% or higher content.

A comparative analysis- on the basis of chemical structure- between traditional fuels and biofuels from rape oil indicates the advantage of the last one. Biodiesel is poorer in carbon and hydrogen than diesel (from petroleum), but contains oxygen which promotes the combustion process of the engine. Also, the total lack of sulfur reduces chemical pollution by SO<sub>2</sub>. Based on these features, use of vegetable oils as fuels becomes possible through some constructive adaptations to the engine. Instead, use of monoesters (biodiesel) produced by

transesterification of vegetable oils with inferior alcohols (methanol, ethanol, etc.) doesn't imply constructive adaptations of engines.

Taking into account all these considerations, the ICIA Cluj-Napoca developed several recipes for both vegetable oils and their blending formulas and also for metylesters and their mixtures with diesel; these recipes were then tested on engines in the Biofuels Laboratory of the UTC-N.

The production of biofuels is regulated by the following documents:

- Council Regulation (EC) no. 1782/2003 laying down common rules for direct support schemes under the common agricultural policy and establishing other support schemes for farmers, with subsequent amendments,

- Regulation (EC) no. 270/2007 of the Commission, of 13 March 2007 amending Regulation (EC) nr.1973/2004 laying down rules for implementing Council Regulation (EC) nr.1782/2003 regarding aid schemes under the headings IV and Iva from the respective regulation and use of land retired from agricultural production for the production of raw materials for biofuels;

- Provisions of EGD (emergency government decision) no. 125/2006 for the approval of direct payment schemes and national direct complementary payments, which are given in agriculture since 2007 and to amend Article.2 of Law no. 36/1991 concerning agricultural companies and other forms of association in agriculture, with subsequent modifications and

- Order no. 549 / 2007 settling the way of implementation, the specific conditions, eligibility criteria for the application of direct payments on land area for energy crops; for the year 2008, the order provides the application of the payment scheme for energy crops within the framework of the community support schemes, and establishes the approval system of the collectors and first operators, in accordance with paragraph. (1), art. 37, Regulation (EC) nr.1973/2003, as amended by Regulation (EC) no. 270/2007.

I. Farmers who cultivate areas of energy crops may be beneficiaries of the scheme of payment for energy crops if they comply with regulations set out above and Procedure for the application of direct payments on land area for energy crops drawn up by the Agency for Payments and Intervention for Agriculture.

II. In accordance with the provisions of GD 44/2004 for approving the Norms for the application of Law nr.571/2003 on the Fiscal Code, amended and supplemented by GD 1861/2006, the producers of biofuels must have authorization for fiscal warehouse for energy production.

The situation of authorized producers of biofuels in Romania is as follows:

**A) Producers holding permits of fiscal warehouse issued by the Direction of Authorization of the Ministry of Economy and Finance:**

1. SC AUTOELITE SRL, Baia Mare
2. SC BLITZ TRANSPORT COMPANY LTD, Comarnic, Prahova
3. SC ULEROM SA, Vaslui
4. SC PRIO BIOCMBUSTIBIL SRL, Bucharest (location Lehliu Gară);
5. SC V & G OIL LLC in 2002, Odobesti, Vrancea;
6. SC VIROMET SA, Victoria, Brasov ;
7. SC ANYKPROD LLC, Grădinari, Olt ;
8. SC LETSOL IMPORT EXPORT LLC, Slatioara, Olt;
9. SC CHIMOFARM LLC, Roman, Neamt ;
10. SC ULTEX SA, Tandarei, Ialomita;
11. SC BIO DIESEL Murgăși, Dolj ;
12. SC REM PETROL TRADE , Pitești
13. SC NICOL ZOE IMPEX , Cosambesti, Ialomita
14. SC BIOVILLE , Ramnicu de Jos, Constanta
15. SC BYOTECH PROD , Ploiesti, Prahova Jud

16. SC EURO PETROLEUM , Slatina, Olt
17. SC HALCIU , Daeni, Tulcea;
18. SC BIOMOTOR PETROLEUM, Deveselu, Olt
19. SC CEROLA SRL, Rm Valcea, Valcea

**B) Requests approved by the Commission of fiscal warehouses within the General Directorate of Industrial Policy of the Ministry of Economy and Finance , to be submitted to the Department of Authorization:**

1. SC NAZAC TRADE SRL Galati;
2. SC PROFILAND LLC, Galati;
3. SC SNOOKER CLUB SRL, Tg. Jiu, Gorj;
4. SC ARTEGO SA, Targu Jiu, Gorj ;
5. SC MARS SA, Roman, Neamt;
6. SC RBD Sigma LLC, Sacele, Brasov
7. SC BIO 2007 START, Satu Mare;
8. SC CHEMISSION LLC, Cugir, Alba.

Biodiesel production has been launched in Romania in 2006. From the official data released by MADR in that year a number of 16 companies produced between 360 and 30,000 tons/ year. In 2007, total manufacturing capacity has been increased to over 300,000 tons as a result of the entry into production of large units. An unofficial classification of the producers in 2007 were the following: "Profiland" Galati 60,000-tons; Priocombustibil "Bucharest-53,000 tons," Chimofarm "Roman-24,000 tons," Byotech "Ploiesti 20,000-tons; Autoelite" Baia Big-18,000 tons, "ULTEX" Tândărei 16,000-tons and Ulerom Vaslui - 12,600 tons. The other companies produced under 10,000 tons of biodiesel.

**III. First processors** are the **oil factories** owning warehouses and licenses to manufacture according to Government Ordinance no. 42/1995 regarding the production of food products for sale, with subsequent amendments, or **alcohol factories**, holding fiscal warehouses, which take over from the beneficiaries or collectors products from the areas cultivated with energy crops on the basis of contracts of sale and deliver to the biofuels producers, on the basis of contracts of sale, equivalent quantities of processed products – vegetable oil, alcohol.

In Romania there are 12 vegetable oil factories.

**IV. Collectors of raw materials necessary for the production of biofuels** are legal entities owning permits of warehouse under the Order of the Minister of Agriculture and Rural Development no. 222/2006, are recorded by district Departments for agriculture and rural development, are buying agricultural products from the farmers on the basis of contracts of sale and deliver them to biofuels producers or first processors on the basis of contracts of sale.

#### 2.1.5. The economic and environmental impact of biofuel promotion

Biofuel is increasingly seen as an integrated element in a well-determined environmental-economic-social system. As such, use of biofuels to power internal combustion engines is influenced, obviously, by **the ability to produce them with a high level of efficiency**, with all the consequences arising in the economic and social fields.

First-generation biofuels, produced in Europe using the most economically attractive production method, result in greenhouse gas emissions 35-50% lower than the conventional fuels they replace.

At least three elements are essential in promoting biofuels:

a) Achieving the *sustainability criteria for biofuels production* (environmental impact - greenhouse gas emissions, maintaining biodiversity, food security, economic, and social impacts);

b) Ensuring the compatibility of quality standards for biofuels and efficiently achieving the target of 10% for 2020;

c) Developing tools to promote new technologies for producing second generation biofuels.

**Criteria for sustainability. Adverse effects of biofuels**

**Macroeconomic impact.** Opening new investment projects for the production of renewable energy sources improves the competitiveness and sustainable development of the economy. The technologies used in this area are characterized by a greater labor-intensity than those involved in traditional energy production, because of the agricultural origin of raw materials. Due to huge resources of biomass in the countries of Central and Eastern Europe, the whole area could benefit significantly from the potential offered by the fast developing market of clean energy sources.

In this context, the "Scheme of the regional state aid for renewable energy resources promotion," authorized by the Romanian government in July 2008, Section 3-A, points out (without quantifying the effects) that renewable energy will contribute to improving the competitiveness of the economy, sustainable development and saving fossil energy resources.

Other major economic effects of promoting renewable energy sources are : *saving fossil energy resources, mitigation of traditional, exhaustible energy imports bill* (coal, natural gas, crude oil) and, consequently, *energy security improvement*. According to data presented in the first "National Action Plan on energy efficiency", annual energy savings of classical energy estimated or actual, resulting from the use of biofuels in Romania, could amount to 360,000 tep/year in 2008 and to 840,000 tep / year in 2009.

Under the "Strategy for the promotion of renewable energy sources" the import of primary energy resources would be reduced by almost 5 million tep (11%) by 2010 and by 5.53 million tep (11.2%) until 2015, by contribution of all renewable sources.

The best way to promote long-term security of supply is to diversify energy sources. In transport, energy diversity is rather low. Biofuels add to energy diversity by increasing the diversity of fuel types and of regions of origin of fuels. It is not obvious how to place a monetary value on this benefit.

Increased biofuel use is the only means at present available to reduce the transport sector's near-complete dependence on oil , and one of the few ways to make a significant impact on transport's greenhouse gas emissions.

**Biodiversity.** Promoting biofuels offers benefits both in terms of security of supply, and on climate change policy. But there are ways of producing biofuels that do not reduce emissions of greenhouse gases, or are even harmful for the environment . For instance the draining of wetlands to produce any type of biofuel would produce a loss of stored carbon that would take hundreds of years to make up through the biofuels' annual greenhouse gas savings. If increased biofuel use leads to feedstock being grown on land that is inappropriate– such as rain forest and other habitats of high nature value – it will cause substantial environmental damage. If the growing of feedstock for biofuels takes place on land that is appropriate for the purpose, the environmental impact (other than greenhouse gas) will be manageable.

As far as the biological indicators of pollution, a very few studies have been conducted in Romania on populations whose habitat is on agricultural land and forestry, and existing data are punctual. So much the less are the prognosis in this field. One can conclude that these areas have a favorable conservation status and there is no major pressure on them or other risk factors.

On the other side an intensive cultivation, energy monocultures promotion, involves the risk of affecting biodiversity, which may lead to deterioration of soil structure and of its biological activity. Disposing of significant unused arable land, Romania has the opportunity to use fallow land for energy crops, rather than resort to sensitive areas in terms of biodiversity.

**Social impacts** derive from factors such as the quality and quantity of employment, respect for fundamental human rights and land rights associated with all agricultural production including the production of consignments of biofuel.

According to the conclusions of the "National Plan for Rural Development," and of the "Scheme of regional state aid for the promotion of renewable energy resources" the production and use of renewable energy resources will offer the opportunity for some isolated areas and / or unused agricultural lands to be attracted within the economic and commercial circulation. In addition, job opportunities will increase in areas with potential for the production of renewable energy, because of additional manpower required in different stages of biofuels production, from energy crops to the installation, operation and maintenance of the capacity for the production of energy from renewable sources . At the EU level 300,000 new jobs are supposed to be created in rural areas as a result of biofuels promotion.

**Environmental impact.** Biofuels have a major advantage: their manufacture and use mitigate greenhouse gas emissions by varying percentages compared with conventional fuels (depending on the raw material used). In addition to improvements in vehicle efficiency, biofuels are one of the few solutions to mitigate greenhouse gas emissions in the transport sector.

First-generation biofuels, produced in Europe using the most economically attractive production method result in greenhouse gas emissions 35-50% lower than the conventional fuels they replace. Other production methods lead to larger or smaller greenhouse gas savings. One production pathway (the production of ethanol in coal-fired plant, with by-products used for animal feed) is estimated to lead to higher greenhouse gas emissions than the conventional fuel.

A number of authorized institutions worldwide have made estimations relating to the amount of greenhouse gas emissions' reduction throughout the lifecycle of biofuels, as follows:

- **Ethanol, of**
  - **First Generation:** Brazil, from sugar –cane (-91%); U.S. corn (-18%); Europe- from wheat (-47%); Europe-from sugar beet (-35%)
  - **Second Generation;** Ethanol from cellulosic wastes (-88%).
- **Biodiesel, of**
  - **First Generation:** from palm oil (Malaysia (-70% to -110%); from soybean oil-USA (-70%); from rape oil-Europe (-21 to -38%)
  - **Second Generation:** from Jatropha (India) (-100 % to -120%)

The ethanol obtained from sugar cane produces 90% fewer emissions of greenhouse gases per kilometer traveled, compared with classical gasoline. But ethanol releases 30% less energy than traditional gasoline in conventional cars, while biodiesel release only 8% less energy compared with the gasoline. The biodiesel fuel produced from palm oil has the most significant positive impact on greenhouse gas emissions. All biofuels produce less environmental damage than traditional organic fuels, but the relative benefits of biofuels produced from corn and wheat are limited. Biofuels from second-generation had a much greater positive impact on the environment, but are (much) more expensive.

The environmental report within the framework of the "National Program for Rural Development", prepared by the Ministry of Agriculture and Rural Development, regarding the possible environmental impact of transposing this program into practice appreciated that the activities under Axis 1 - 1.3 specific goal 1.3, and under the Axis 3 -- specific goal 3.1, will have an indirect positive impact (marked by 1 point on a 5 degrees scale of assessment ( from -2 to +2) developed by specialists of MARD). This impact will consist in a moderate reduction of pollutant emissions and an improvement of beneficiaries' behaviour in relation to environment. MARD evaluation is taking too into account the impact of biomass and biofuels' production and use.

**Assessment of negative effects of promoting biofuels:**

1) The extra cost of biofuels depends on oil prices, the degree of dependence on traditional energy imports and the competitiveness of agricultural markets. Biofuels are not yet competitive in relation to oil, requiring subsidization of production, at least on short and medium term. An increase in oil prices could reduce the cost gap between oil and biofuels, and this effect may offset the increase in agricultural products' prices.

2) Biofuels' combustion is neutral in terms of production of carbon in the atmosphere because unlike fossil fuels, which return carbon that was stored beneath the surface, biofuels can produce energy without causing a net increase of atmospheric carbon. This is because as new plants are grown to produce fuel, they remove the same amount of CO<sub>2</sub> from the atmosphere as they will release as fuel. Some studies have found that certain crops may produce more harmful greenhouse gases than CO<sub>2</sub>, indicating that the specific biofuel used is an important factor. It was noted however that intensive farming practices to produce raw materials for biofuels could release in the atmosphere greater amounts of nitrogen protoxide. This pollutant agent could multiply by 296 times the greenhouse effect, by comparison with carbon dioxide.

3) Biofuels are produced from plants that are grown with massive amounts of oil (in the form of pesticides, fertilizers, fuel used by agricultural machines, etc.), having also an extremely low rate of return of the energy invested - sometimes even negative. The production of ethanol from corn, requires 6 units of energy to produce one! Biodiesel (which in EU countries is usually produced of rape) is much more efficient than ethanol, with a 3 to 1 rate of energy return, but still does not compare with oil (which has a rate of 30 to 1).

4) The availability of land is another problem. It has been calculated that almost 4 hectares are necessary to grow enough corn to feed a vehicle to travel 15,000 km, or a year, in time units, the same to produce food for 7 persons during a year. Due to inefficient production techniques, by using ethanol, carbon dioxide emissions would be reduced by only 13% and the speed of cars would be reduced, because the efficiency of ethanol is equivalent to 70% of that of petrol.

5) Promotion of energy crops could entail as a side effect an increase in food prices, which in certain circumstances, may undermine the food security of some countries or areas. A recent OECD report warned that irrational development of energy crops risks to stimulate an uncontrolled increase in prices of basic foodstuffs, with direct effects on the food industry and to destroy biodiversity, by reconverting important agricultural lands from grain crops to energy crops. OECD report concluded that reducing energy consumption, especially in transport (by increasing the engines 'efficiency') would constitute a cheaper and more ecological solution than substituting some energy resources with others.

European Commission tried to counter this theory, arguing that OECD report did not produced evidence proving a link between increased food prices and biofuels as far as EU: while most of the EU biofuels originate in agricultural sources, only 2% of the EU arable land has been allocated for biofuel (energy) crops and the effect on food prices in this region would have been only 5%.

***Ensuring the compatibility of quality standards for biofuels and efficiently achieving the target of 10% for 2020.*** The main challenge for EU trade policy is to find ways to promote those types of biofuels that will clearly contribute to reducing emissions of greenhouse gases and to minimize the loss of biodiversity, to prevent the use of poor quality systems for biofuels and to encourage the use of the manufacturing processes of the second generation. This system should avoid discrimination between domestic production and imports, the preferential use of a particular type of biofuel or certain raw materials to the prejudice of others, but on the other side, has to encourage the production of all kinds of biofuels the least harmful to the environment.

Romania has pledged to match the national standards for biofuels to EU standards, while diversifying the domestic range of biofuels and approving new local brands would have a favorable effect on both quality and quantity of supply. EU has recently recommended

revision of the standard EN14214 to increase the range of vegetable oils that can be used in the production of biofuels. This standard provides a maximum amount of iodine in biofuel, but Romanian producers are able to observe this ceiling if rape oil is used as feedstock. In case of sunflower oil an additional stage of processing is necessary, but production costs are somewhat higher. Another European standard -EN 590- is somewhat limited, requiring an improvement. EU policy to impose binding quality standards for various fuels is already a non-tariffary barrier used by EU to limit imports of bioethanol from Brazil, but can become a problem even for Romania, taking into account its high potential to produce and export to EU markets in the EU.

Under these circumstances, local producers of biodiesel are favouring the development of a Romanian standard, adapted to local conditions and more permissive as far as iodine content, using sunflower oil as feedstock. In addition, Romania will have to take into account recent EU policy of gradual substitution of classical diesel engines, by engines adapted to ethanol blended with diesel. EU has a greater production capacity for bioethanol than for biodiesel because of the advantage of using a lower agricultural area and of better prospects for cheaper costs for industrial products.

Romanian research in the field of biofuels production and use ranks among the most advanced in Eastern Europe, being already connected to the EU network.

### **3. Romania and EU's Energy Strategy**

#### **3.1. Romania and Caspian energy**

##### **3.1.1. Romania's geopolitical position on the "sea axis": Caspian Sea – Black Sea – Mediterranean Sea**

Romania is located on the path of several economic, but also geopolitical axes, which connect Western Europe with Eastern Europe and Asia. Out of these axes, the only one favourable to Romania, from an energy point of view, is the sea one, especially the Caspian Sea – Black Sea segment (will be detailed below); and this is only because the two terrestrial axes (West – East and North West – South East) are under Russian "control", and the rivers and canals axis (Danube – Main – Rhine) is of no concern regarding hydrocarbons transport.

In addition, Romania represents the most important and advanced front of Euro-Atlantic structures (NATO and the European Union) towards the East (Turkey – larger and with a more numerous population – is only a NATO member, while Bulgaria, which is a part of both structures, is half the size of Romania and has three times less population).

After the collapse of the Soviet Union (1991), the ex-soviet space, especially the one orbiting the Caspian and Black seas, has become a war zone with hot spots (Chechnya, Nagorno – Karabakh, South Ossetia) or frozen conflicts (Dagestan, Abkhazia, Transnistria, Crimea); also the conflict in Eastern Turkey, inhabited by Kurdish people, can be added.

Although Romania struggles to take a more active part in the Black Sea politics, the three major players in the area are **Russia**, **Turkey** and **Ukraine**. The relations between them and all the other countries in the region are still very unsettling, with the, sometimes surprising, creation and dissolution of alliances that have a direct or indirect effect on the energy corridors, which are of interest to this study.

**Russia** and **Ukraine** have tensed relations due to the pro-Western orientation of the latter, the significant percentage of Russophone population (Russia reserves the right to intervene in the "immediate vicinity" to protect its fellow countrymen and sympathisers), the frozen conflict in Crimea (a territory given to Ukraine by Nikita Hruschov, in 1954, in which the three similar sized populations want something else: the Tatars – independence; the Ukrainians – to remain part of Ukraine; the Russians – to return to Russia).



The **Russia** (Soviet Union) – **Turkey** long time hostile relations (because of Turkey being the American “pawn” in the Eastern superpower’s side), have recently become amicable, due to the common interest regarding energy corridors.

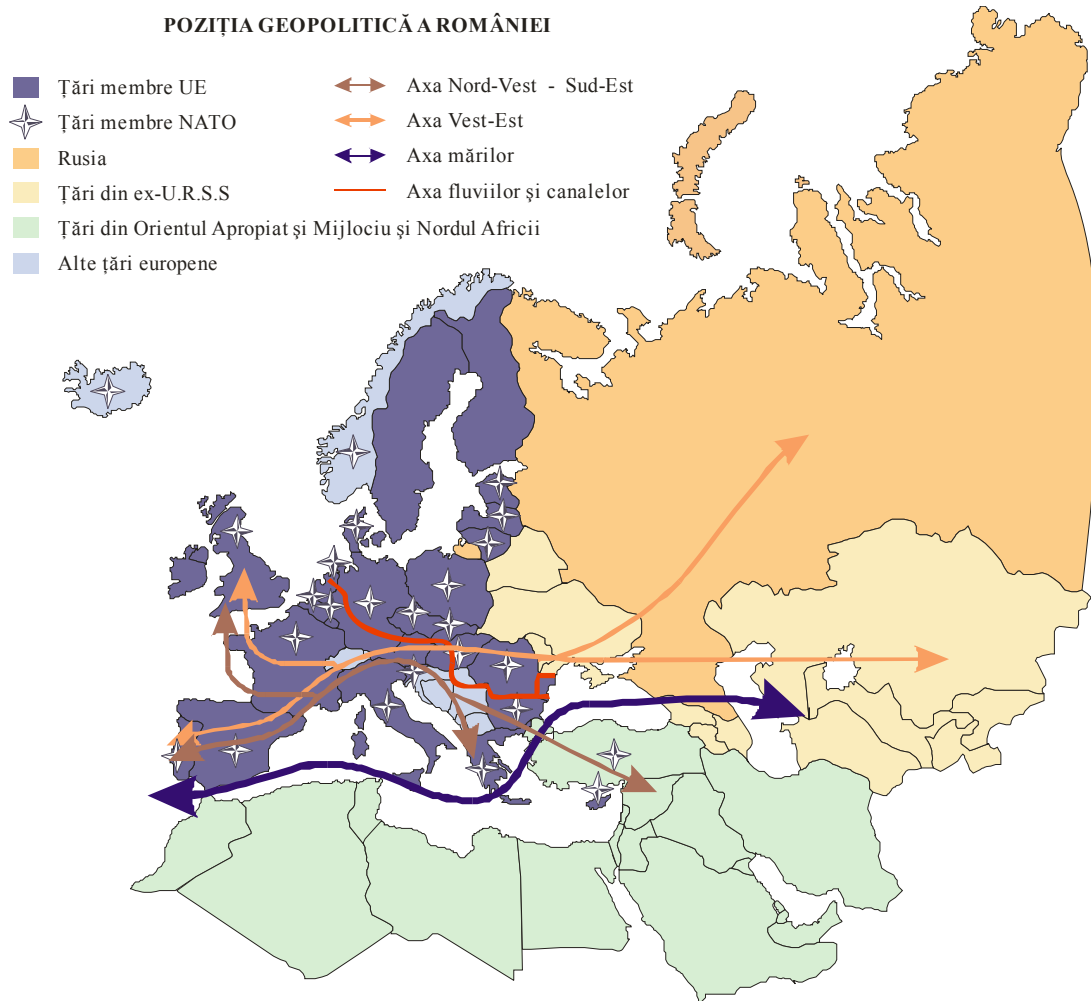


Figure 3 – Romania at the crossroad of the continent’s main geoeconomical and geopolitical axes

After the Soviet Union’s collapse (1991), the Kremlin was faced with the challenge of promoting cooperation relations with the Western powers, especially the U.S.A. Not because it really sympathised the Western democratic system, but because it wanted to overcome the economic and political crisis, with the Western world’s help. In turn, to counter the ex-soviet conservative potential, which aimed at bringing back the communist power, the Western powers gave Moscow great concessions: they tolerated the Russian Federation’s exaggerated claims to be recognised as sole “rightful successor and continuer” of the Soviet Union (among others, the permanent member seat in the UN Security Council, though Ukraine has a similar request), they created the joint NATO – Russia council (basically giving Russia the right to legally express her vote regarding the Transatlantic Alliance’s actions) and welcomed her in the most developed/powerful group of countries, the famous G7, becoming G8.

Lately, Russia managed to exit its shadow cone, becoming more active on the world scene: it hosted the first G8 summit on Russian soil (July 2006, Sankt Petersburg), it is part of the SCO (Shanghai Cooperation Organisation), it is about to be accepted in WTO, but it especially lays the stakes for the energy games in relation with the Western world (the energy subject was always present on the list of problems discussed at all the major summits in the last few years, that Russia attended).

Because the main *security provider* for, among others, the ex-communist countries is clearly the American power, Russia has chosen to be an *energy supplier*. It still uses energy resources as a “political tap”: “the gas war” with Ukraine and Georgia (2006), “the electric energy war” with Georgia (2005), the psychological pressure on the European Union (mostly for natural gas) and Japan (for oil) after signing contracts with China, to which Russia is going to supply large quantities of both hydrocarbons, which could affect deliveries towards other commercial partners.

Also in the spirit of the “political tap” we can situate Russia’s attitude, even boycott, towards Romanian initiated energy projects (Constanța - Trieste oil pipeline) or projects with Romanian participation (NABUCCO pipeline).

### 3.1.2. Romania – the Caspian energy’s gateway into Europe? Involved players. Transport routes. Vulnerabilities and risks

The Caspian sea region has been under scrutiny lately, due to, on the one hand, the conflicts in the ex-soviet area (the best known conflict being the one in Chechnya), and on the other hand, the large reserves of hydrocarbons (oil and natural gas) which place it, according to some sources, on the second place in the World (after the Middle Eastern area). Such a situation couldn’t not give birth to many players’ desire of “control”, the area currently being the object of a complex political, diplomatic, economic and military game. The essence of the “Caspian game” resides both in the control of oil and natural gas production and in the control of the routes by which these resources are transported towards the world’s markets.

Given the fact that the Middle East is for almost 30 years a war zone, affecting oil deliveries (and thus prices), it was almost natural the shift in attention towards the Caspian sea.

The energy basin of the Caspian Sea presents at least two advantages in comparison with the Middle East:

- it is closer to the West (the beneficiary countries);
- it is more settled (there have been and there still are conflicts – those in the Caucasus, Chechnya and so on – but no wars); along with the Russian – Georgian war in August 2008 the perspective has changed, but the large projects in the area were launched before this event.

Azerbaijan, Kazakhstan and Turkmenistan are the three republics separated from the former Soviet empire that have already started to have a powerful say in what regards energy resources at the beginning of the 21<sup>st</sup> century. The oil and gas reserves discovered here, but insufficiently explored, have caught the attention of the developed world and these hydrocarbons must reach Europe by routes that would not create dependencies, more so since there already are two other big producers in the area, respectively the Russian Federation and the Gulf countries.

Therefore, the problem of Caspian resources is no longer just an economic one, but also a political one, reason why, to date, neither the European Union, nor the United States possess a clear strategy towards the Caspian region and, particularly, towards neighbouring Russia.

In 2006, for example, the cumulated production of these three countries was less than 100 million tons, more precisely 94.5 million tons (below the potential by far), the repartition among the countries being as follows: Kazakhstan – 62.6 million tons, Azerbaijan – 22.4 million tons and Turkmenistan – 9.5 million tons.

Given the facts, two problems remain unsolved: the first represents the financial capabilities of the aforementioned countries to invest in prospecting and exploration activities while the second relates to the means of transporting the respective resources towards the distribution markets. With the exception of the BTC pipeline (Baku – Tbilisi – Ceyhan), the

existing oil pipelines only connect to the Russian Federation, and, anyhow, they do not have the capacity required for future quantities of pumped oil.

In order for the Caspian oil to reach Europe and considering the fact that oil pipelines in the Caspian region have the eastern shore of the Black Sea as their destination, and the transit through the Bosphorus and the Dardanelle is limited both from an ecological point of view and in regards of transport capacity, there are talks about building a new route from the Western shore of the Black Sea towards the West, inside the European continent. The following represent projects from the Caspian Sea to Europe:

- Burgas – Alexandropolis.
- Constanța – Omisalj – Trieste.
- Odessa – Brody – Gdansk.
- Turkmenistan towards Central and Western Europe, via Azerbaijan and Georgia;
- Turkey – Bulgaria – Romania.

Romania, who was one of the world's biggest producers and, at the same time, exporters of oil between the two World Wars, and respectively, of natural gas, after World War II (in both cases, ranking 4<sup>th</sup>), is, nowadays, an importer of both. Its oil production (5.2 – 5.4 million tons annually), as well as its natural gas production (10 -13 billion m<sup>3</sup>) are insufficient to cover the country's consumption needs, Romania becoming an importer. As a consequence, Romania has become very interested in the major energy projects, particularly in those generically classified under the expression <<the Caspian energy's road to Europe>>.

### **The Caspian Basin – economical and geopolitical connotations**

The Caspian Sea is a stretch of water between Europe and Asia, with the Caucasus Mountains in the West, Elburz in the South and the Ust`Urt/Ustiurt Plateau to the East. Without having any connections with another marine stretch or with the Planetary Ocean and despite its large area (371 800 km<sup>2</sup>) and name (*sea*) there are debates related to its status: is it a sea or a lake? The answer to this question became of present interest after the collapse of the Soviet Union, the new emergent states (Azerbaijan, Kazakhstan and Turkmenistan) having a different view than that of the Russian Federation, mostly because of the hydrocarbon deposits and the Western's and Eastern's (China, Japan) interest in them.

Basically there are two different views:

- Russia considers the Caspian Sea an ***international lake*** and thus no riverside country can lay claim to an exclusive area of this sea or hinder freedom of sailing and also, all decisions must be taken in agreement by all the five states; Iran has a similar position in connection with the 1921 and 1940 treaties signed with the Soviet Union;
- the other three states consider the Caspian Sea a ***sea*** and thus they ask that the United Nations Convention on the Law of the Sea (UNCLOS), from 1982, be applied, according to which each riverside state would be entitled to a sea territory of no more than 12 nautical miles (22,224 km), an exclusive economic area (EEA) of no more than 200 miles (332 km) and a continental platform, hence a sector division of the Caspian Sea.

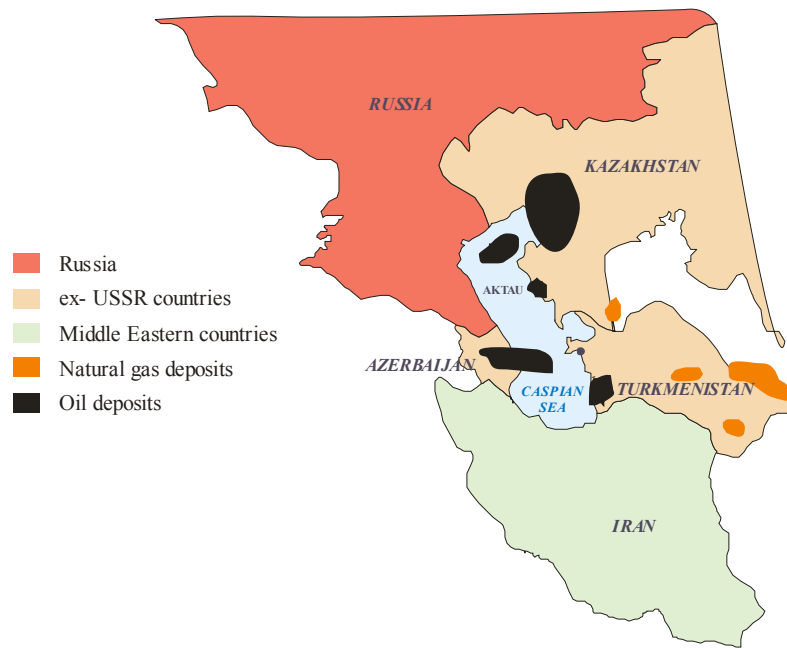


Figure 4 – Caspian basin riverside countries

Although it maintained its opposition towards the sector division of the Caspian Sea for a long time, in 1996 Russia accepted to recognise a 45 miles (83,34 km) exclusive economic sea area for each country and to discuss independently with each state the national jurisdiction of oil and gas reserves outside the EEA. This way Russia would insure control over the production, transport and marketing of the hydrocarbons in the area.

#### ***Economic aspects***

The Caspian region has become an “El Dorado” of oil, a place of pilgrimage for heads of states, oil magnates, and a point of convergence and dispute for the two major players on the scene of international relations: USA and the Russian Federation.

The quantity of Caspian reserves differs significantly depending on the source of information. Thus, according to USA’s Department of Energy, the reserves are somewhere around 200 billion barrels, placing the region on second place in the world, after the Middle East<sup>3</sup>. On the other hand, the British company British Petroleum estimates the reserves to just a quarter of the above (approx. 48 billion barrels). Other sources estimate even lower numbers, around 25 billion barrels. As a matter of fact, most sources point out real reserves significantly lower than those forwarded by the American Department of Energy, varying between 25 and 100 billion barrels.<sup>4</sup>

The reasons behind these large discrepancies are both economical and political. Exaggerating the numbers favours the Caspian states – like Azerbaijan, Kazakhstan, Turkmenistan – who are aiming to better their economic situation, which on a short and medium term is possible, mostly, thanks to the oil companies’ investments; the oil companies consider the existence of large hydrocarbons reserves in the areas that benefit from these investments as an advantage. On the other hand, the United States is using this immense quantity (some analysts claim it’s only fiction) to exercise pressure on the OPEC and avoid oil price rise – objective at which they failed if we look at the unbelievable price rise in the last 3-4 years (from approx. 50\$/barrel to almost 150\$/barrel).

The largest known oil reserves in the Caspian region are the ones in Kazakhstan (39.8 billion barrels according to some sources – 3.29% of the world total<sup>5</sup>) and Azerbaijan (7

<sup>3</sup> Energy Information Administration (EIA), US Department of Energy.

<sup>4</sup> Javeir Morales, *Reserves y transporte de petróleo en el Mar Caspio: el oleoducto Baku-Tbilisi-Ceyhan*, UNISCI, 2004, pag. 2-3.

<sup>5</sup> British Petroleum, *Statistical Review of World Energy* 2007.

billion barrels – 0.58% of the world total<sup>6</sup>); for the Russian and Iranian ones in the Caspian region there aren't any estimates, only as a total (Iran – 137.5 billion barrels, 11.38% of the world total; Russia – 79.5 billion barrels, 6.58% of the world total).

Among the regional oil fields noticeable are:

- Tengiz, Kashagan and Karachaganak (Kazakhstan); the oil field of Tengiz, discovered in 1988 but entered exploitation after 1995, is thought to be one of the largest in the world, some sources indicating it is richer than Ghawar (in Saudi Arabia), which holds the world record of approx. 10 billion tons.
- Azeri, Chirag and Gunashli (Azerbaijan)

No matter the motivation a spectacular increase in interest for Caspian hydrocarbons can be seen, not only from the oil companies but also the “players”. This is based on several reasons: 3. increased interest of Asian players, such as China and Japan, for Caspian hydrocarbons (mainly oil, for now).

- the reserves are obviously large and with chances to expand, considering that many Caspian areas are still unexplored;
- Western world's desire (EU and USA mainly) to reduce dependency on the Middle East;
- the increased interest of Asian players, such as China and Japan, for Caspian hydrocarbons (mainly oil, for now).

### ***Geopolitical aspects***

Over the last two centuries the Caspian Sea Region has been under the influence of two powers: “The Russian Empire” (Soviet Union) and Persia (Iran). What the Tsarist Empire managed to conquer – in the battle with the Ottoman and Persian Empires – will remain incorporated even after its collapse and the creation of the U.S.S.R. However, in December 1991, with the collapse of the Soviet Union, the Caspian region states gained their independence: Azerbaijan, Kazakhstan and Turkmenistan, all three being Islamic countries, supplementing Iran (Persia's new name since 1935), also an Islamic country.

Russia's desire to maintain influence in the ex-soviet region has led to the creation of the Community of Independent States (Alma-Ata/ today Almaty, the former capital of Kazakhstan, December 21<sup>st</sup> 1991), to which the three former communist Caspian states adhered. The only problem was that the new association of states didn't meet Russia's expectations of restoring the Soviet Union in another shape. Additionally, both in the Russian Federation's territory and in that of other regional countries, powerful conflicts ensued such as those in Chechnya (Russian Federation) and Nagorno Karabakh (Azerbaijan).

Furthermore, the Caspian Sea Region has become both the meeting and the confrontation place of USA's and Russia's spheres of influence. If during the Soviet Union, the Caspian Region was almost entirely inside its sphere of influence (the sole exception being the Iranian sector), after the collapse of the USSR, Russia – as the Soviet Empire's “successor” – lost a lot of its sphere of influence in favour of the United States. Along with American investments came the “coloured revolutions” (“the orange revolutions” in Georgia and Ukraine and the “tulips revolution” in Kyrgyzstan) which further decreased the size of Russia's sphere of influence.

A unique case in the area is represented by Iran, which, for a long time, was in a state of war with Russia. Additionally, after the Second World War, during Shah Mohammed Reza Pahlavi's rule, Iran was an important ally of the United States and a thorn in the Soviet Union's back. After the Islamic revolution in 1979, Iran became anti-American and gradually bettered its relations with the Soviet Union and Russia. Nowadays the collaboration between the two countries is significant.

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<sup>6</sup> *Idem.*

### **Main players involved**

This region represents a crossroad for the interests of several categories of players: state players (regional countries which have oil and natural gas and other countries that don't have such resources but want to get involved) and non-state players (large oil companies, international organisations etc.).

According to some analysts<sup>7</sup>, based on the geographic position and access to resources, the states interested in Caspian energy are classified as follows:

- *Riverside states*: Russia, Kazakhstan, Azerbaijan, Turkmenistan, Iran;
- *Inner circle*: Afghanistan, Armenia, Georgia, Turkey, Uzbekistan;
- *Outer circle*: China, India (two large emergent powers), Ukraine, Pakistan, Israel, Saudi Arabia (regional players) and the group of major powers (USA, European Union and Japan).

The essence of the Caspian game resides in both the control of oil and gas production and the control of the pipelines through which the hydrocarbons are going to be transported to the world's markets. This has led to another classification of the regional players: “*oilers*” and “*gamers*”<sup>8</sup>.

### **Transport routes**

#### ***Pan-European energy corridors*** (Russian, European and American views)

From an EU perspective, these corridors have a double objective: to complete the economic and territorial integration of Eastern Europe (ex-communist) into the European market but also to be a strategic way of ensuring the European economy's future (by ensuring a good proportion of the required raw materials, mostly energy).

As for the best routes to transport oil and natural gas from the ex-Soviet area, particularly the Caspian region, to Europe there is a harsh competition. Thus:

- Moscow wants to continue transporting hydrocarbons across Russia towards the North and North West and across the Black Sea towards the West:
  - a) Connecting the Caspian pipelines, existent or future, to the famous Drujba/Friendship pipeline (4 023 km in length), which has been supplying Central Europe for a long time; it has two branches – a North one, supplying Poland and Germany and a South one towards Czech Republic, Slovakia, Hungary and Croatia (the end of the pipeline is in the Croatian harbour of Omisalj at the Adriatic Sea );
  - b) Transporting through straits (Bosporus and Dardanelle) or to harbours located on the Western coast of the Black Sea (preferably in Bulgaria) and then on through pipelines across the Balkan Peninsula all the way to the Adriatic Sea.
- Western Europe and the U.S.A. want to avoid these routes, a first step in this direction, and also an example, being the BTC (Baku – Tbilisi – Ceyhan) oil pipeline.
- The other countries in the region or vicinity, whether they have hydrocarbons resources (Azerbaijan, Kazakhstan, Turkmenistan) or they just subscribe or can subscribe to energy corridors (Georgia, Turkey, the Balkan countries, Romania, Hungary) associate only with some projects in accordance with their personal interest.

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<sup>7</sup> R. Hrair Dekmejian, Hovann H. Simonian, *Troubled Waters: The Geopolitics of the Caspian Region*, I.B. Tauris, 2003, pag. 43.

<sup>8</sup> Enayatollah Yazdani, *Competition over the Caspian oil routes: Oilers and Gamers perspective*, Alternatives: Turkish Journal of International Relations, vol. 5, nr. 1-2, 2006, pag. 51.

***Caspian energy corridors*** (different views)

Considering that the local Caspian hydrocarbons market does not require a large quantity of these, the countries' economy is still affected by the collapse of the Soviet Union, increasing the production is meaningless if it (especially oil) isn't transported at a great distance. Naturally the need for building transport pipelines arose:

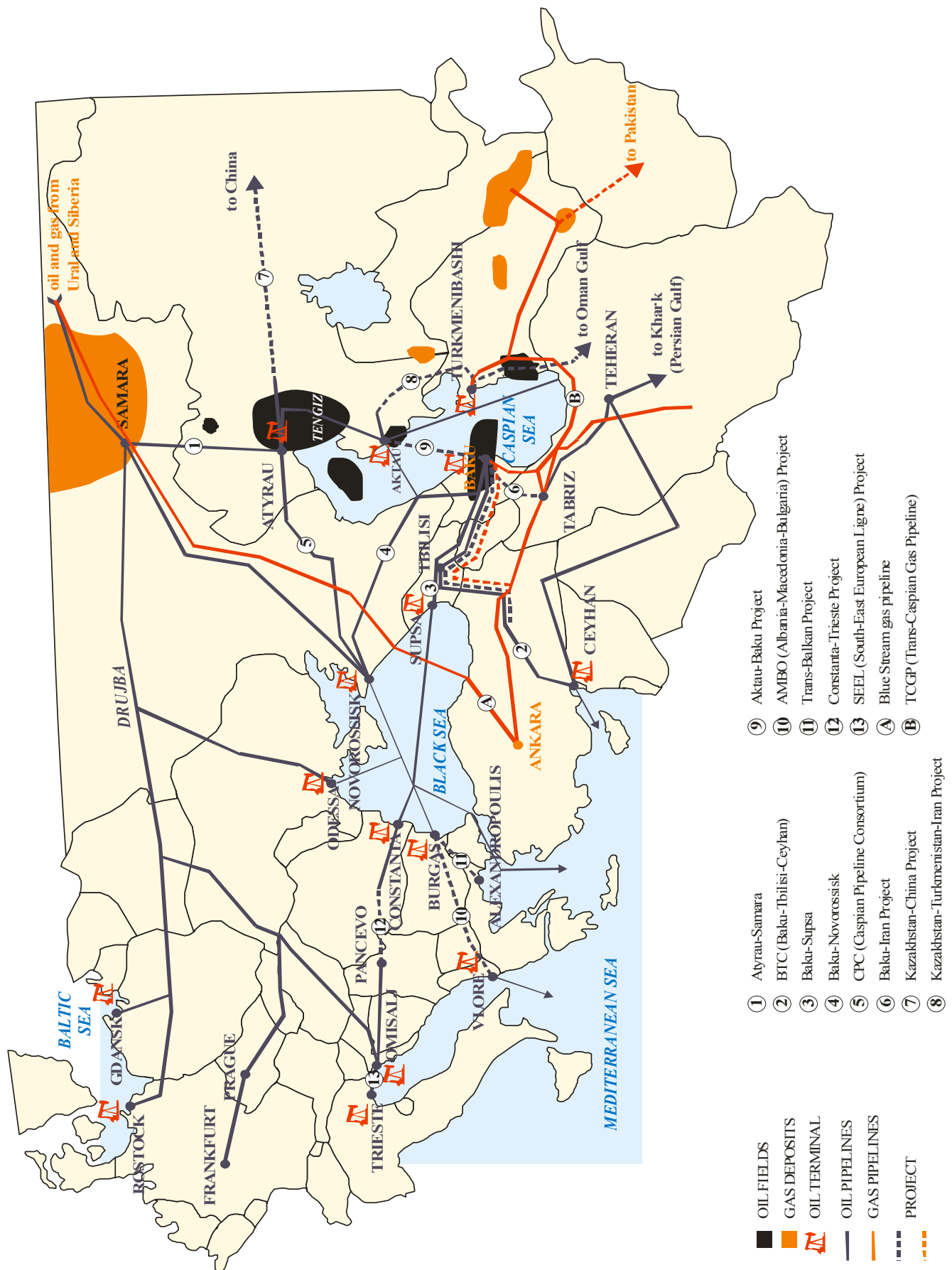
- On the one hand, from the Caspian deposits (terrestrial or underwater) to the oil specialised harbours on the Eastern coast of the Black Sea or directly to the Mediterranean Sea;
- On the other hand, from the Black Sea towards the Western world.

If to the producing (and also exporting) countries we add the ones that facilitate the transit towards the beneficiaries – that obtain large revenues from transit taxes, pipeline maintenance costs, personnel salaries etc. - we realise that the routes' stakes are very high. If we also add the other players' interests (main beneficiaries like EU, U.S.A and large companies) the stakes become even higher

A well known American analyst, Zbigniew Brzezinski, a connoisseur of the region, stated that “whoever controls or dominates access to this region is the one entitled to win the economic prize”.

This reason makes the solving of the oil and gas pipelines problem essential for the future of the Caspian Sea region and, additionally of Central Asia. There are two options:

- a) **Russia maintains its monopoly** (so far only the Baku – Tbilisi – Ceyhan pipeline is an exception): if the main pipelines continue to cross Russian territory, the region will remain politically dependant on Moscow to decide how to distribute the region's wealth; Russian monopoly is also maintained in the case of the pipelines “led” by the Russians on preferential routes that are under their complete control such as:
  - *Novorossiysk oil pipeline* (Russia, on the Eastern coast of the Black Sea) – Burgas (Bulgaria, on the Western coast of the Black Sea) – Alexandroupolis (Greece, on the Northern coast of the Aegean Sea, part of the Mediterranean Sea);
  - *South Stream gas pipeline* (900 km), on the bottom of the Black Sea, towards Bulgaria (Varna harbour) and on through Greece all the way to the Ionic Sea, reaching Southern;
  - *AMBO oil pipeline* (913 km): → Bulgaria (Burgas harbour) – Macedonia – Albania (Vlorë harbour, at the Adriatic Sea).
- b) **Eliminating the monopoly**, by building as many pipelines as possible that would avoid Russian territory:
  - *Baku* (Azerbaijan) – *Supsa* (Georgian harbour at the Black Sea) *oil pipeline*, with 833 km in length and a capacity of 145 000 barrels/day, put into service in 1999; it was the first project that completely avoided Russia;
  - *Constanța – Trieste oil pipeline*;
  - *NABUCCO gas pipeline* (both are presented below in greater detail)





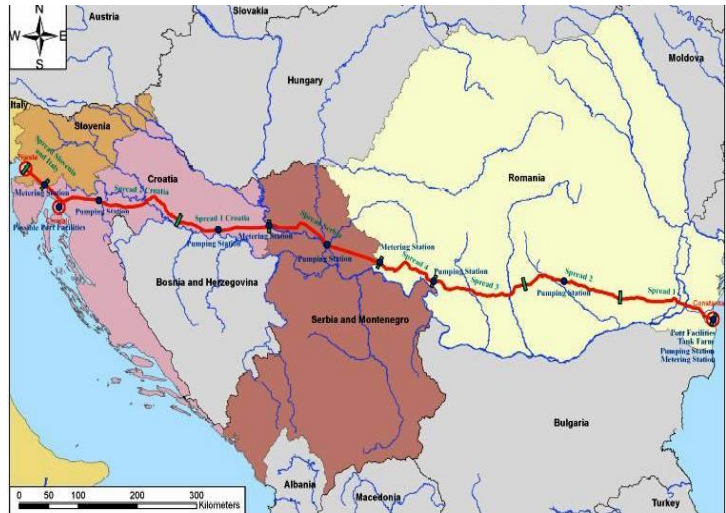
*Constanța – Trieste oil pipeline*

Out of all the grand projects regarding oil transportation from the Caspian region to the heart of Europe this is the most far-reaching and competitive.

*Route:* Black Sea (Constanța harbour, Romania) – Adriatic Sea (Trieste harbour, Italy), crossing five countries: Romania, Serbia, Croatia, Slovenia and Italy.

*Objective:* to transport oil from the Caspian Sea region (mainly from Kazakhstan and Azerbaijan), through the Black Sea (from the Caucasian oil specialised harbours, particularly, Supsa, from Georgia to Constanța, Romania, the biggest harbour in the Black Sea basin) towards Western Europe.

Figure 6 – Constanța-Trieste oil pipeline route



Trieste harbour was chosen as a terminus point for several reasons:

- Large storage capacity;
- From here the oil pipeline can be connected to the Trans Alpine Pipeline Network, which connects Italy with Austria and Southern Germany;
- In addition, Italy is in dire need of oil given the fact that it possesses the largest refining capability out of all the European countries (c. 115 mil. Tons).

*Length:* 1 360 km.

*Capacity:* according to a feasibility study (coordinated by Hill International UK), three capacity alternatives are being considered: 40, 60 or 90 mil. Tonnes/year.

*Costs:* 2.27; 2.81 or 4.26 billion \$, depending on the capacity alternative chosen.

*Completion date:* 2009, 2011 or 2012.

The Constanța – Trieste oil pipeline project presents several advantages:

- The route (1 360 km) is shorter than the BTC oil pipeline (1 760 km);
- Two thirds of the pipeline's length already exists, only lacking connectivity;
- It only crosses low regions, requiring only two pumping stations (in comparison with close to 20 for BTC), which are characterised by high electric energy consumption and obviously higher costs;
- The complete absence of hotspots (BTC, for example, crosses the Kurdish territory);
- Constanța harbour has large capacities for storage and processing;
- The need for oil of the crossed countries (Romania, Serbia, Croatia, Slovenia) or the ones in the neighbourhood (Bulgaria, Hungary, Austria) is added to Western's Europe need.

These favourable elements were mentioned in order to emphasise, once more, how complex the problem of "winning" an energy corridor really is. This project (Constanța – Trieste) also participated in the 2007 competition (entitled <<Caspian energy's road to Europe>>) where it lost in favour of the BTC (Baku – Tbilisi – Ceyhan) project, one with less favourable elements. It won because the U.S.A. and Great Britain gave Turkey political support, basically their old soviet ally from the Cold War period and the desired Middle East ally (which in fact won't confirm).

### *NABUCCO pipeline*

After the “gas war” between Russia and Ukraine (2005 - 2006), the European Commission regained interest in the older NABUCCO project, as an “alternative source of energy”, designed to provide natural gas for Central Europe (its main beneficiary being Austria). “It’s not just a technical project, but a political one as well”, said the European Commissioner for Energy, Andris Piebalgs.

*Purpose:* the transport of natural gas from the Caspian Sea region (especially from Azerbaijan, although the “Iranian part” is also under consideration) towards Central Europe, with the route Turkey – Bulgaria – Romania – Hungary – Austria. As in the case of the Constanța – Trieste pipeline, the NABUCCO gas pipeline aims at reducing the dependency, in this case only on Russia, who is the European Union’s main supplier (40% of its consumption is provided by Russia).

The main features of the gas pipeline are:

*Length:* 3 300 km.

*Capacity:* \$26 – \$32 billion m<sup>3</sup>/year, at first.

*Costs:* approx. \$5 billion (out of which approx. \$1 billion is Romania’s contribution).

*The Companies* that voiced their intention to partake in the building of the gas pipeline: OMV (Austria) – around 50%, TransGaz (Romania), MOL (Hungary), BulgarGaz (Bulgaria) and Botas (Turkey).

*Completion date:* construction beginning in 2008, partially operational in 2011 and fully operational in 2020.

The completion of this project surged in importance to the EU after the signing of the agreements between China and Russia (concerning both types of hydrocarbons) in 2006, because it might prove impossible for Russia to satisfy EU’s need for gas.

Unfortunately, the agreement regarding the project has not yet been finalised because Turkey, who initially accepted NABUCCO, is now delaying its signing procedures. There are rumours that, after the completion of the underwater gas pipeline Blue Stream (Russia - Turkey) on the bottom of the Black Sea (in November 2005), Russia is influencing Turkey to consider building gas pipelines solely on its territory.

Figure 7 –  
NABUCCO gas pipeline  
route



### **Geopolitical and geostrategic implications. “Political tap” or “Russian roulette”?**

When there is only one energy supplier to a number of countries, it can dispose at its whim the suspension of exports or any reductions of afore established export quantities. Although, in many cases, technical reasons are invoked, in reality they are political (to “punish” a certain country), thus the use of the “political tap” collocation.

For instance, during the night of 21<sup>st</sup> and 22<sup>nd</sup> January, 2006, two explosions affected the main section and a secondary branch of the Mozdok – Tbilisi gas pipeline, the main

pipeline supplying two former Soviet republics (Georgia and Ukraine). The deflagrations occurred on the Russian part, not far from the border with Georgia. Shortly after, another deflagration cut down the supply of electric energy to Georgia.

The Russians accused the Georgians and the Armenians of “sabotage”! In reality, they had no interest, since it all took place in the midst of winter (January!) and their reserves would only last for 24 hours. Therefore, the Georgian president, Saakashvili, denounced Moscow’s “blackmail”: “I’ve been hearing, for a long time, the threats of Russian politicians that we might be left without natural gas and power, and now those threats materialised.”

Some analysts go further and notice many similar scenarios:

- ❑ After Russia substantially increased the price of its natural gas supplied to Ukraine and Georgia, the analysts regarded this as a form of reprisals following the “Georgian Revolution” in December 2003, the “Orange Revolution” in Ukraine in December 2004, the “Tulip Revolution” in Kârgâzstan in June 2005, while GAZPROM also announced the price increase for gas delivered to Belarus (the price tripled beginning with 2007). It was believed that, actually, the Russian company wanted to take over 50% of the shares of Belarusian company Beltransgaz, the owner of the gas pipe network supplying Europe, in order to stop paying taxes to Belarus; after Belarus’ strong reaction (Russia’s most loyal political partner), the Kremlin ended its pressures.
- ❑ Russia erased Algeria’s debt (\$5 billion) on two conditions:
  - First: the buying of \$4 billion worth of weapons (40 MIG 29s, 20 SU-30 planes and 40 T-90 tanks);
  - Second: *GAZPROM*’s access to its oil and natural gas deposits, Algeria being Europe’s third energy supplier, after Russia and Norway; in addition, Algeria is also a member of OPEC.
- ❑ In March 2006, Russian president Vladimir Putin, signed with Chinese president Hu Jintao, an agreement to build two natural gas pipelines to China, thus becoming the country’s number 1 supplier. The agreement spawned concern within the European Union, because the gas that was going to be delivered to China was to be extracted from Western Siberia, the same region that provides the gas exported to Europe. The deliveries were set to start in 2011, between 60 and 80 billion m<sup>3</sup> annually. Kremlin announced that Russia might also build an oil pipeline, thus upsetting Japan as well, since it could not meet both Asian demands.

All these elements – and others may be added (the boycotting of the NABUCCO project – which also includes Romania –, the recent reopening of the Burgas - Alexandropolis oil pipeline and so on) – suggest, according to some analysts, that Russia is currently transforming itself from a “defunct military superpower – although still nuclear – into a new energy superpower”<sup>9</sup>.

Another Russian project:

*Caspian Pipeline Consortium*

This is another project which shows that Russia is pursuing its own interests at the cost of those of the transit countries (mainly Romania). The project is about oil transportation from Kazakhstan (from the large deposit of Tengiz), through Russia, to the Black Sea, in the area of the Novorosijsk harbour (large storage and expedition/loading facilities are going to be built nearby).

Main facts:<sup>10</sup>

*Pipeline length:* 1 100 km, out of which 752 km already exist (Tengiz – Komsomolik – Kropotkin), and 258 km are going to be built.

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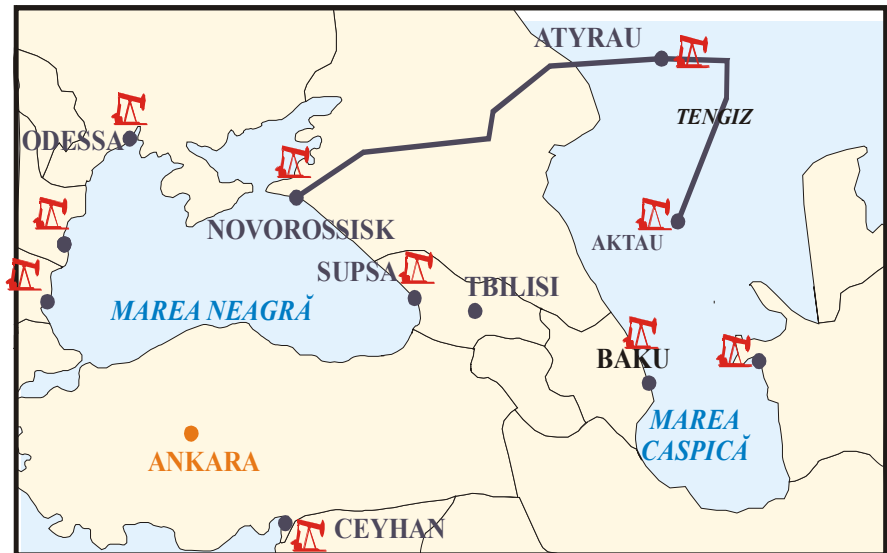
<sup>9</sup> \*\*\*, *Russia’s Newly Found “Soft Power”*, in „The Globalist”, 26 August 26, 2004.

<sup>10</sup> Vezi și Terry Adams, *Caspian Hydrocarbons, the Politicisation of regional pipelines and the Destabilisation of the Caucasus*, Center for European Policy Studies (CEPS), Bruxelles, 2000.

*Facilities:* 15 new pumping stations, 13 storage tanks (each one with a capacity of 100 000 m<sup>3</sup>), out of which, 5 near Novorossiysk. *Main shareholders:* Russian government (represented by Lukoil, Rosneft and Transneft) – 24%, Kazahoil – 19%, Oman Government – 7%, LukArco (JV Lukoil and Atlantic Richfield – U.S.A) – 12.5%, Rosneft Shell – 7.5%, Mobil (U.S.A) – 7.5%, Kaz Pipeline Ventures (JV Kazahoil, Amoco, ex Munai Gaz Holding) – 7% and others.

*Project length:* approx. 40 years; will function at minimum capacity beginning with 2014;  
*Income:* Russia estimates own profits of \$23-24 billion.

Figure 8 – Caspian oil pipeline route



An “OPEC” for  
Natural Gas?

OPEC’s role on the world scene following the “oil shocks” of 1973 is well known. It knew how to exploit at its fullest the most used and sought after strategic energy resource; there have been, of course, gaps along the way, but they do not concern this study’s subject. Lately, there is talk about a similar gas cartel. Although some are still inclined to assign the concept’s paternity to Iranian ayatollah Ali Khamenei, who in January 2007 made such a proposal, “Financial Times” used the concept two months before (November 2006) when, quoting a NATO Report, it mentioned Russia’s desire to create such an organization. The configuration of the anticipated cartel is extremely interesting, as it would contain Russia, some countries from the Gulf Region (Iran and Qatar), from North Africa (Libya and Algeria) and from Central Asia (Kazakhstan, Turkmenistan, Uzbekistan, and others). This would certainly wield a huge amount of power, since Russia and Iran alone concentrate 43% of the world’s natural gas reserves!

### ***Routes vulnerabilities and risks***

#### ***Transit risks***

Out of all the risks that can affect the energy corridors we mention:

##### ***a) Political risks:***

- Already existent conflicts, such as Chechnya (Russian autonomous republic, predominantly Islamic, transited by all the Russian pipelines from the Caspian Sea towards the Black Sea) and recently, South Ossetia (Russian – Georgian war), which affects the newly designed energy routes;
- Conflicts put to rest (but still smouldering), like those in Nagorno-Karabakh (Azerbaijan – Armenia) and Kosovo, for example the Varna – Vlorë pipeline is going to pass by this ex Serbian province;
- Conflicts which can become active again like Dagestan (Russian autonomous republic, also predominantly Islamic, with passage to the Caspian Sea, that has oil fields and is crossed by pipelines) and Kurdistan,

the region from Western Turkey, crossed by the Baku – Tbilisi – Ceyhan oil pipeline.

- b) *Economic risks*: because taxes obtained from the hydrocarbons transit represent an important percentage of the government income, it leads to the desire of taking unilateral measures (of raising the taxes). Also the fact that certain Caspian states governments don't make the difference between incomes obtained at a certain time (respectively transit taxes) and the benefits from investments (direct foreign investments), being tempted to act on a short term (choosing incomes and joining the "game" of tax raise) and not on a long term (emphasising investments) contributes to the problem.

In addition, some of the pipeline alternatives imply the transit of other rival producer countries: for example, Kazakhstan and Turkmenistan can only export towards the Western world through Azerbaijan or Russia. In such a case, it can appear the risk of competition: the transited country, producer of hydrocarbons, can undermine the oil or natural gas transport from another producer, having the interest of promoting its own offer.

- c) *Ecologic risks*: because of the continuous development of the hydrocarbons production and the intensification of their maritime transport, the risk of oil leaks or other accidents increases. The danger to the environment is greater here than in other areas, because the Caspian Sea is an isolated sea, which means that pollution can persist in the region for a longer period of time. Besides the degradation of marine waters and shores, there is also the possibility of affecting marine life, mainly sturgeons, and, as we all know, the Caspian Sea is the main supplier of black caviar in the World.

The ecologic problems equally concern the transit of the Black and Mediterranean Seas, the two straits that connect them (Bosporus and Dardanelle) being very affected over time; furthermore Turkey opposed the intensification of oil traffic through the straits – there is also the speculation that it is doing this, not because of ecologic reasons but economic ones (respectively to promote terrestrial routes that transit Turkey, like BTC).

### **3. 2 The Energy Strategy of Romania and the European Union**

#### **3.2.1. Energy Strategy of the European Union**

**The European Union**, a powerful industrialized area of the world, is an economic competition with countries of North America (U.S.A. and Canada) and the countries of East Asia (Japan, South Korea, China). **Energy is a main factor which conditions the development of the European Union and the economic competition.**

**The major problems that the energy raise in the EU** refer to: the choice of energy sources, the security of primary energy supply, the pressure of environmental protection, the oil price evolution, the functioning of the energy market.

In the paper of the European Commission (published in 2000 and finalized in 2006) "Green Paper - Towards a European strategy for the security of energy supply", the situation of the EU (2000) is examined; later (2006) this paper has been approved as the energy strategy of EU in the perspective of the year 2030.

The analysis of the current situation has highlighted the following main conclusions:

- The present consumption of primary resources of the EU is: oil 41%, natural gas 22%, coal 16%, nuclear energy 15%, renewable sources 6 %. The present energy dependence of the EU on external sources is 50%.
- The reserves are concentrated in a few countries.

Approximately half of the consumption of natural gas of the EU comes from only three countries (the Russian Federation, Norway, Algeria), and 45% of oil imports from the Middle East. If the current trends are maintained, the gas imports will increase by 80% in the next 25 years. A big concern is that if the EU will not be able to improve its energy sector efficiency, **over the next 20-30 years, approximately 70% of the energy demand of the Union will be covered from imports**, some of which will come from areas threatened of insecurity, which is considered totally unacceptable.

- The EU energy sector is unable to cover the consumption mainly from the internal resources, is an economy with an intensive use of energy, the resources are limited (some indepletion in the medium term), and the energy supply to the EU is compared to "a Gulliver in chains".
- The EU present energy options are characterized as follows: nuclear energy – “a controversial source”, coal - "a glorious past”, oil - "still favorite”, natural gas - "to a new dependence”, new and renewable sources - "a political priority”.
- From the standpoint of **the environmental impact**, 94% of CO<sub>2</sub> emissions are due to activities in the energy and transports.

During 1990-2010, 90% increase in CO<sub>2</sub> emissions are due to transport. Finally, through the Kyoto Protocol, the EU pledged to reduce emissions of greenhouse gases by 8% between 1990 and 2010; unless appropriate measures are not taken, the emissions in 2010 will increase by 5% compared to 1990, compromising the EU's commitment to fulfilling the provisions of this Protocol.

- World energy demand is growing. It is estimated that the demand for energy worldwide -and CO<sub>2</sub> emissions- to grow by around 60% by 2030. World oil consumption rose by 20% from 1994, while the world oil demand is expected to grow by 1.6% per years.
- Prices of oil and natural gas steadily increase too. In the last two years they have almost doubled in the EU, producing the increase of heat and electricity prices. This situation is however very difficult for consumers. Due to the growing demand for fossil fuels, the big length of large supply networks and increasing dependence on the imports, the prices of oil and natural gas will continue, with high probability, to remain high. This can have a positive effect, however, namely to generate measures to promote energy efficiency and innovation.
- There is an urgent need of investment. Only in Europe, to meet the foreseeable demand for energy and to replace the obsolete infrastructure, in the next 20 years investment of about 1000 billion Euros will be needed.
- The problems facing contemporary society today and with which it will face in the coming years are: the need for oil of the rich countries struggling for supremacy, the need for an accurate information, the threat of mass destruction weapons, daring of the terrorist groups, the probability that governments are not honest with the people they lead, the responsibility and the loyalty of the members of the government.

**The future of the energy sector** is marked by a number of problems of which the most important appear to be:

- Increased consumption of energy and the increasing dependence of the human society of various forms of commercially available energy;
- The impact of this sector on the environment, including a substantial contribution to global warming and climate change;
- The depletion in time of fossil fuels sources, with the first effect the increasing of prices on world markets;
- Technological and economic difficulties in the use of renewable energy sources and the limited useable potential of these sources.

These problems do not have simple and not unique solutions and their search exceeded, long time ago, the concern of specialists, being currently the major topics of public interest.

In March 2006, the European Commission reviewed the situation of the European Union and possible developments in the field, publishing the findings in a document called “The Green Paper - A European Strategy for sustainable, competitive and secure energy”. The title itself reflects the objectives that the European Union and has set for its energy policy: sustainable development of the sector in harmony with the environment and the transformation of the energy sector in a factor of competitiveness and stability, both in terms of satisfying the European requirements for energy and imports respectively. The strategy should develop six priority areas:

- Develop competitive markets for electricity and natural gas;
- Ensuring security of supply in the Member States and promoting a mechanism of solidarity between them in the field of energy;
- Organize a debate on energy sources, including the costs of use and their impact on the environment;
- Addressing the issue of climate change in a manner consistent with the Lisbon objectives;
- Develop a strategic technology plan at European level to ensure optimal utilization of European research and innovation potential;
- Developing a common foreign policy to ensure the achievement of basic objectives such as energy security in the long term, a functioning energy market, sustainable economic development and reduce environmental impact.

Green Paper sets out a number of areas in which member countries should cooperate more: saving energy, promoting renewable energy sources, investment in new energy technologies and the use of a single voice in international discussions and negotiations on energy issues.

In the last years, the EU adopted **a number of measures in the energy sector**, in order to help the economic development and the environmental protection. Of these, we mention:

- Develop competitive markets for electricity and natural gas.
- Allocation of funds for research into new energy technologies.
- The introduction of competition-based mechanisms to reduce the impact of energy on the environment (examples: emissions trading and support schemes for promotion of renewable sources).
- Measures to promote energy efficiency.

Among **the energy targets** adopted by EU directives, mandatory for the Member States we shall point out:

- Doubling the share of renewable energy resources in the gross energy consumption of the Union from 6% to 12% in 2010.
- Increasing the share of electricity produced from renewable sources in total consumption from 14% to 22% in 2010.
- Increasing the share of biofuels in transport to 5.75% in 2010.

Besides the measures to increase energy efficiency it is expected the reduction of energy consumption by 20% in 2020 compared to the estimated consumption in the absence of such measures.

In “The Green Paper - A European strategy for sustainable, competitive and secure energy”, the European Commission proposes that in a number of areas, the efforts should be coordinated at the EU level, avoiding the dissipation of resources through initiatives and actions uncorrelated at the national level. In addition to the six priority areas a number of concrete actions were identified also, outlined below.



- a) Development of the internal markets of electricity and natural gas.
- b) A review of the mandatory stocks of oil and natural gas.
- c) A European Energy Observatory, in order to increase transparency on the demand and production of energy in member countries.
- d) Improving the electricity network safety.
- e) A new mechanism to prepare and assure the solidarity and the assistance for the countries in difficulty.
- f) A large debate in the Union of the future of various energy sources.
- g) An action plan for energy efficiency, with commonly agreed objectives.
- h) A road map for the renewable energy sources.
- i) A strategic innovative energy technology plan.
- j) A foreign policy correlated at the European Union level.
- k) A review of the European Union energy policy.
- l) Establishing a list of priorities for the constructions of new infrastructures.
- m) Relaunching the dialog with Russia.
- n) A treaty on the European Energy Community.
- o) A new mechanism at the Community level for a rapid and coordinated response to face the crisis situations affecting the energy supply with resources of the Member States.

The measures provided for in “The Green Paper - A European strategy for sustainable, competitive and secure energy”, have been subject to public debate for nearly a year; the European Commission received over 1,500 written reactions from organizations and associations concerned with the future of the energy and from simple citizens. Following the examination of these reactions, the Commission published on 10 January 2007 a coherent package of documents that forms the proposals on a “New European Energy Policy”, proposals adopted by the Parliament and the European Council in March 2007.

The documents published by the European Commission in early 2007 under the name “A New European Policy on Energy,” are built on three ideas: a) to demonstrate that the objectives already established at the Community level on energy can not be achieved with the current policies, being necessary to review these policies, b) to propose a strategic objective to form the basis for all decisions of the future energy policy, c) to propose a concrete action plan to achieve the strategic objective.

As a strategic objective the Commission proposed to reduce emissions of greenhouse gases by 20% by 2020. Focusing on emissions of greenhouse gases is justified by the fact that the energy sector contributes in proportion of 80% to the total volume of emissions. This objective is embedded in the broader objective of managing the climate change and represents a good target for subsequent objectives on the promotion of renewable sources, improving energy efficiency and the development of cleaner technologies. The target of 20% reduction in emissions of greenhouse gases represents a minimum commitment, unilaterally stated by the European Union. It is clear that a positive influence of the climate change can not be obtained only through the efforts of Europe's citizens.

Considering the challenges facing all members of the EU, represented by the climate change, the increasing dependency on imports and the higher prices of energy, “The Energy Policy for Europe” is based on three pillars:

**1. Sustainability (sustainable development):** energy is the main contributor (to the extent of 80% of all greenhouse gases emitted by the EU) to the climate change and air pollution, it is necessary to limit the global increase of temperature to 2°C compared with the pre-industrial levels era.

**2. Security of energy supply:** Europe is increasingly dependent on imports of hydrocarbons (oil and natural gas), 50% today and 65-70% in 2030 (in the scenario “business as usual”), involving political and economic risks. It is foreseen the increase of imports of natural gas from 57% to 84% in 2030 and of the petroleum from 82% to 93%.



**3. Competitiveness:** The EU is increasingly exposed to the volatility of prices and increases in prices on the international markets of energy and to the progressive concentration of hydrocarbon reserves in several groups of decision. EU should develop an energy policy that would benefit from the favorable effects of liberalization of energy, from the achievement of the internal market for energy, to accelerate investment in energy, from the promotion of energy efficiency and the renewable energy sources, all in favor of increasing the standard of living and the creation of new jobs.

The overall proposed objective has an effect on security of energy supply in the long term. By achieving this goal there will be a reduction in exposure of Europe to the volatility of prices for fossil energy resources, it will stimulate the development of the internal electricity and natural gas markets and it will encourage the technological development.

Form the overall objective three objectives result, for each of them the European Commission proposing a target:

- Increasing the share of renewable sources in the total energy mix to 20% in 2020;
- Improving energy efficiency by 20% by 2020;
- Increasing the share of biofuels in transport to 10% by 2020.

For achieving the proposed objectives of the common energy policy, the European Commission has elaborated an action plan in ten points:

1. Better use of the internal energy market;
2. Facilitating the mutual assistance between Member States in the case of an energy crisis;
3. Improving the mechanism for emission trading permits for greenhouse gases;
4. Energy efficiency;
5. Increasing the share of renewable energy sources;
6. Clean and efficient technologies for production and use of energy;
7. Clean technologies for fossil fuels;
8. Safety and security of nuclear energy ;
9. Establishment of a common international policy and expressing its as a "one voice";
10. Better understanding of energy issues.

With the energy policy of the European Union adopted in March 2007 a coherent framework is created for action not only to ensure the energy future of the European Union, but also to reduce the environmental impact, in particular, the climate change. One set precise targets, unilaterally in the Union. This gives an example to the rest of the states of the world and thus Europe take the lead role in the fight for a cleaner and secure world.

In accordance with the conclusions of the the “Energy Council” of 15 February 2007, on the transposition of the new comunitary policy in the field of energy, the European Commission presented in September 2007 the third package of legislative proposals to liberalize the internal energy market (electricity and natural gas). This package includes the projects of several directives and regulations, including the review of Directives 2003/54/EC and 2003/55/EC on the common rules of the internal market for electricity and natural gas, respectively.

**a) Patrimonial separation of transport networks.** The most sensitive element of the new package is a proposal for patrimonial sharing (“ownership unbundling”) to pursue the effective separation between the operating activities of the transport network of electricity and natural gas and any other activities in the energy sector. It is still possible the possession by the state property both of the property on the transport and system operated on other producers, with the conditions under which these companies are not grouped together in a common structure, such as a holding company.

**b) Strengthening the independence and the role of regulators.** Unlike Romania, in many countries of the European Union regulatory authorities in the field of energy have limited powers on the creation of market competition, and their independence is limited. In

these circumstances, the European Commission proposes in the new legislative package to enhance the regulator competences.

To be able to meet their obligations, the regulators should have investigative powers, to apply all the necessary information and to impose the discouragement penalties. It proposes that the regulator should be distinct legal and independent in its activity of any public or private entity, that its staff and any member of its decision body to act beyond of any market interest and not to accept or seek instructions from the government or other public or private entity. The independence is ensured by a distinct legal personality, budgetary autonomy, adequate human and financial resources, and autonomous management.

**c) The Agency for the regulators cooperation.** Creating a single market for energy in the European Union requires a close collaboration between authorities involved in regulating the activities of the sector. However, there is currently a diversity of models of national markets and network codes provisions, proof of the modest results of cooperation between the national regulatory authorities structures. In these circumstances, the European Commission proposes the creation of a supranational structure, the Agency for the cooperation of regulators, with a complementary role at the European level having in view the powers of the national energy regulators.

Meanwhile, the European Commission proposes to create a structure for cooperation between operators and system transport of the Member States.

**The new legislative package on promoting renewable energy sources and reducing the energy sector impact on the environment.** The European Commission has the final phase of drafting of a new legislative package to ensure the attainment of targets approved by the Council for 2020: to reduce by 20% compared to 2005 of the emissions of greenhouse gases, providing from renewable sources of 20% of gross energy consumption, insurance of biofuels to 10% of the consumption of transport fuels.

In achieving the target on the use of renewable energy in the energy mix, a major problem is the sharing between the member countries of the approved target of the European Union. Compared with 2005, when the share of renewable sources in the total gross consumption of energy of the Union was 8.5%, it is necessary a growth of 11.5% by 2020. The Commission proposes that half of this increase should be allocated pro rata to all member countries, and the other half is allocated differentially, depending on the gross domestic product per capita. It ensures in this way a fair distribution in relation to the financial backing of renewable energy sources. Since this method of allocation does not take into account the differences in potential regarding the renewable sources of the Member States it will be required to create a mechanism between countries for the transfer of origin guarantees associated with the energy produced from these sources.

### 3.2.2 Energy Strategy of Romania

#### **General objective and strategic objectives**

"The Romania's energy strategy for the period 2007-2020" was approved by the Government Decision no. 1069/2007 and published in the Official Gazette no. 781 of 19 November 2007. The strategy has been developed in line with New Energy Policy of the European Union, launched in January 2007 and approved by the European Council in March 2007.

The general objective of the energy sector strategy is to meet energy needs both now and the medium and long term, at a price as low as possible, appropriate for a modern market economy and for a standard of civilized life, in terms of quality, safety of supply, complying with the principles of the sustainable development.

The strategy provides three strategic objectives: sustainable development, competitiveness, security of energy supply.

#### **Sustainable Development**

- promoting the production of energy from renewable sources, so that the share of electricity produced from these sources in the total gross consumption of electricity to be 33% in 2010, 35% in 2015 and 38% in 2020. From the gross domestic consumption of energy 11% will be provided from renewable sources by 2010;
- stimulate investment in improving energy efficiency across the chain: resources - production - transmission - distribution - consumption;
- promoting the use of liquid biofuels, biogas and geothermal energy;
- supporting the research and development activities and the dissemination of the usable research results for energy;
- reducing the negative impacts of the energy sector on the environment by using clean technologies.

### **Competitiveness**

- further development and improvement of markets competitive mechanisms for electricity, natural gas, oil, uranium, green certificates, certificates of emissions of greenhouse gases and energy services;
- expanding the activity of the wholesale market Operator of electricity from Romania – OPCOM, at the regional level and the active participation in the realization of regional energy market and a single European market;
- free transit of energy in the technical controlled condition of safety and ensuring the permanent and non-discriminatory access to the transport networks and international interconnections; increased capacity of the interconnection of electricity grids from approx. 10% at present to 15-20% at the horizon of year 2020;
- continue the restructuring process, increase the profitability and privatization in the energy sector (privatization will be achieved both by strategic investors and by listing on the stock market).

### **Security of supply**

- maintaining a balance between imports of primary energy resources and rational and efficient use of the national reserves on economic and commercial bases;
- increasing the adequacy of the transmission network through the development and modernization in the concept of the intelligent network (smart grid) and in compliance with the requirements of UCTE / ETSO;
- approach, in common with the EU Member States, the problems relating to the protection of critical infrastructure in the energy system in the fight against terrorism;
- conclusion of long-term contracts for natural gas imported in order to reduce the risk of interruption of supply, with the compliance of the competition rules;
- diversification and strengthening, in the framework established at the European level of the relations of cooperation both with countries producing oil and with those of transit;
- diversify the sources of supply and developing the alternative transport routes.

### **Energy security will be ensured through:**

- setting instruments related to security of installations, storage capacities, energy networks and infrastructure, including nuclear installations;

- promotion of tools to encourage the investment for electricity generation capacities, which are necessary for energy security in accordance with Directive 2005/89/EC;
- promotion of projects designed to ensure an increase in interconnection capacity of the electricity system with the countries of South-Eastern Europe (with Turkey by a submarine cable, 400 kV electric lines with Serbia, Hungary and Republic of Moldova);
- programs on increasing the security of hydropower works;
- increase the capacity of underground storage of natural gas;
- interconnection of the National Transport System of natural gas and oil with the similar systems in neighboring countries:
  - Interconnection with Hungary, the connection Arad-Szeged;
  - Interconnection with Bulgaria, the connection Giurgiu-Ruse;
  - Interconnection with Ukraine, the connection Cernautzi-Siret;
  - Interconnection with Moldova - the route Drochia-Ungheni;
  - Oil pipeline Constanta - Trieste.

#### **Measures for achieving the strategic objectives**

To accomplish the priority objectives, "The Romania's energy strategy" provides the following types of measures:

- General measures, valid for all energy sub-sectors (mining, extraction, transport, distribution and storage of natural gas and petroleum products, and also for generation, transmission and distribution of electricity and thermal energy);
- Specific areas measures: environmental protection, energy efficiency, restructuring / privatization and accessing the Structural Funds;
- Measures specific to each sub-sector.

#### **General Measures**

- Improving the institutional and legal framework in line with the requirements for ensuring competitiveness, environmental protection and safety of energy supply;
- Improving the policy prices for fuels, heat and electricity, having in view the principles of non-discrimination, transparency and objectivity and the gradual introduction of competition mechanisms;
- Better utilization of the human potential, increased labor efficiency and improving the working conditions based on continuing the process of restructuring and reorganization of modernization of companies management in the sector;
- Technological development of the energy sector by stimulating and supporting national research;
- Attracting the foreign and local capital, giving priority to projects of international cooperation;
- Develop competitive markets for electricity and natural gas and their integration into regional and European markets.

#### **Specific measures**

##### **A. Environment Protection**

- The execution of investments in the environmental protection and gradually internalize the environmental costs into the price of energy;
- Framing the thermoelectric plants in conditions of the Directive 2001/80/EC on the limitation of emissions of certain air pollutants (SO<sub>2</sub>, NO<sub>x</sub> and

particulate matters) from large combustion installations, on Directive 96/61/EC on prevention and integrated control pollution, and Directive 99/31/EC related to industrial waste storage;

- Framing thermoelectric power plants in terms of greenhouse gas emissions in the shares provided by the National Allocation Plan (PNA) for the certificates of greenhouse gas emissions for 2007 and 2008 - 2012, exceeding quotas being achieved only with the acquisition of certificates and corresponding increase in the price of electricity delivered;
- Promotion of clean technologies: capture and storage of CO<sub>2</sub> from flue gases from burning coal, fuel cells and the use of hydrogen as energy vector;
- Taking over by the Romanian state of all environmental damage produced by coal until the moment of license concession;
- Elaboration of the feasibility study, of the design documentation starting the construction of the Final Deposit of Low and Medium Active Wastes (DFDSMA);

The estimated value of the necessary investments for environmental protection in the conforming period of 2008-2017, is about 2600 million euro.

#### **B. Promoting renewable energy sources**

- Increasing the better use, in terms of economic efficiency, of the renewable energy resources for the production of electricity and heat through facilities in the investment stage, including the facility to access the electricity network;
- Promotion of mechanisms to support the use of renewable energy resources in the production of heat and household hot water;
- The use of structural funds;
- Improving the market of green certificates;
- Promoting the use of biofuels:
  - In 2007, on the market for fuels, the biofuels and other renewable fuels will be use in the proportion of at least 2% of the total energy content of all types of gasoline and diesel used in transport;
  - By the end of 2010, the percentage of use of biofuels will be at least 5.75% (the target set by Directive 2003/30/EC);
  - By 2020, the percentage of use of biofuels will be at least 10%, under the conditions of using the new generations of biofuels.

In accordance with the provisions of the strategy to support renewable energy sources, the need for investments in the period 2006-2015 is estimated to 1800 million Euros.

- The European Union launched to debate, in January of 2008, the new legislative package of climate change - energy. Among the proposed directive in this package, it should be reminded the proposal for a directive on promoting the use of energy from renewable sources, which provides for mandatory legally targets binding on the overall share of renewable energy for each Member State.

- Thus, for Romania it is provided the increased share of renewable energy in total final energy consumption, from 17.8 in 2005 to 24% in 2020.

- To ensure the fulfillment of this objective, Romania will have to strive to formulate guide paths that will trace the way to achieving its own objectives and to establish a national action plan, which also will include sectorial objectives, while taking into account the considerations of environmental, financial, energy security and other issues.

- Coming to meet this draft Directive, the Ministry of Economy and Finance has already in the process of approving a project to improve the GD no 1892/2004 for the establishment of the system to promote the generation of electricity from renewable energy

sources. Among the provisions of this draft decision, one may list some major changes that will provide certainty to investors: the time for which it will apply this system has been modified, it will be assigned a greater number of certificates for electricity produced by photovoltaic systems technology, the maximum and minimum trading prices of green certificates have been increased, that is 50 euro / certificate and respectively 26 euro / certificate, it resolves the problem of physical and legal entities that have units of electricity generation from renewable power installed less than 1 MW.

**National targets.** The share of electricity produced from renewable sources (E-SRE) in the gross national consumption of electricity is: 33% in 2010 (commitment under the Directive 2001/77/EC), 35% in 2015, 38% in 2020.

Under the new draft directive on the promotion of renewable energy sources - 23 January 2008: the share of electricity produced from renewable sources in the gross national energy consumption in 2020 is: 24%; the increased share of renewable sources in the total energy consumption from 2005 – 2020 is 6.2 %.

### **C. Improving energy efficiency**

- Increased efficiency in the use of electricity and natural gas in industry;
- Continued investment for the rehabilitation of the centralized heating systems (district heating) in towns and reduce the energy losses;
- Support the National Program to increase the energy efficiency for the period 2006 - 2010, with a mechanism of financial support from the state budget and local budgets;
- Imposition of standards for energy efficiency in industry, transports, construction, agriculture, services and residential sector;
- Creating the legislative framework necessary for the development of competitive energy services market;
- Promoting the white trading certificates to stimulate investments in increasing energy efficiency, in the conditions of the development of a European practice in this regard;
- Promoting actions on the management of energy consumption, DSM (Demand Side Management);
- Provide tax and financial incentives for projects to increase the energy in efficiency, compliance with laws on state aid.
- On 19 October 2006, the European Commission has adopted the Action Plan for energy efficiency that includes measures due to which the EU could make visible progress towards fulfilling its main objective, namely reducing its global consumption of primary energy by 20% by 2020.
- The Directive no 2006/32/EC on energy efficiency to end users and energy services, which becomes mandatory for Romania in 2008, stipulates that EU Member States undertake to achieve the reduction of final energy consumption with at least 9% in a period of nine years (2008-2016), compared with the average consumption in the past five years for which data are available (2001-2005).
- Following the provisions of art. 14 (2) of this Directive, in Romania it was developed the first National Action Plan on Energy Efficiency, which was submitted to the European Commission, alongside with all Member States, in June 2007.
- The Intermediate target set for Romania for 2010 is 940 thousand toe, which corresponds to 4.5% of the average energy consumption of the years 2001-2005, and 1.5% annually for the first three years. In setting this target one had in view the potential of energy savings of Romania, from the economic

sectors within the scope of the Directive no 2006/32/EC, namely industry, other branches than those included in the National Allocation Plan for emissions, residential, tertiary and transports.

### **C.1. Mining sub-sector**

- The concentration of production in viable areas and safe closing the unprofitable areas;
- Modernization and rehabilitation of equipment in viable mines for hard coal and lignite;
- Support the production of hard coal through the granting of state aid in accordance with agreements between the Government and the EC under Directive 1402/2002;
- Promoting technologies for better use of methane gas from hard coal deposits;
- Increase the geological research to improve knowledge level on the deposits of coal and uranium and the using there value;
- Rehabilitation of areas, restoration of natural environment affected and labor reconversion;
- Ensure the trading of production by contracts of medium and long term with prices negotiated on the basis of formulas based on stock exchange like other carriers of primary energy;
- Ensure purchase the land necessary for the development of lignite exploitation.

### **C.2. Oil and natural gas sub-sector**

- Intensification of geological research in order to discover new reserves of crude oil and natural gas;
- Rehabilitation and dispatching the pipeline systems for transport of natural gas and crude oil, implementing the system of command and data acquisition in real time (SCADA);
- Promoting the cross-border interconnection projects: Nabucco project (the transit of natural gas from the Caspian Sea to Western Europe through Romania), the interconnection with the system of Hungary in the area of Arad-Szeged, with the system of Ukraine in the area of Siret-Cernautzi, with the system of Bulgaria in the area of Giurgiu-Ruse and of the PEOP project (the transport crude oil pipeline Constanta-Trieste);
- Increasing the underground storage capacity of natural gas, for taking over the peak consumption during the cold season, and to improve the security of supply natural gas to consumers. The measures and actions taken by the operators of storage deposits of natural gas are aimed at increasing the safety coefficient in the delivery of gas at levels as close to those of the countries of the European Community;
- Increasing the storage capacity, so as to achieve the value of 2.8 million tones crude oil for 2011, to ensure minimum stocks for 67.5 days, calculated on the basis of projected growth of the domestic consumption;
- Developing a national system of transport, a distribution networks of natural gas and increasing the natural gas supply and the security of operation.

### **C.3. Electricity and heating sub-sector**

- Reorganization of the electricity generation sector by using the market and privatization mechanisms on the capital markets or with strategic investors;

- Better use with high efficiency of coal in rehabilitated units and new units with advanced technologies, in compliance with environmental standards;
- Privatization of the thermoelectric power plants with relatively high costs. Where the privatization is not carried out, these unprofitable capacities, will be closed;
- Privatization of the Energy Complexes of Turceni, Rovinari and Craiova;
- Develop joint ventures to build new capacities in the thermoelectric power plants of SC ELCEN SA and SC Termoelectrica SA;
- Continue the privatization process of microhydro power plants and privatization of hydro units of average power;
- Erection of hydroelectric pumping-storage power plant Tarnitza-Lăpușești. The funding will also be ensured by the contribution of the private capital;
- Continue the program of nuclear energy through completion by the year 2015 (starting of commercial operation) of Units 3 and 4 of Cernavoda, by attracting private capital;
- Continue the production of heavy water at RAAN Drobeta-Turnu Severin, at competitive prices, for covering the demand of Units 3 and 4 of the Cernavoda;

#### **D. Financial resources for the proposed measures:**

**D1** - Financial resources obtained from privatization and restructuring of companies from the energy sector.

**D2** - Financial resources obtained by commercial companies of the energy sector and from their own sources and credits obtained from the external funding bodies (World Bank, EBRD, EIB, JBIC) or from commercial banks, without sovereign guarantee of the Romanian State. These financial resources are supported by the prices charged by operators and by the long term contracts.

**D3** - Financial resources obtained through the establishment of commercial joint ventures for realizing the investment in new energy units in (brown / greenfield).

**D4** - Financial resources obtained through the use of specific mechanisms promoted under the Kyoto Protocol and the post-Kyoto, to reduce anthropogenic emissions of greenhouse gases through the joint implementation of projects (Joint Implementation) and by developing "green investment schemes "(GIS).

**D5** - Financial resources obtained from structural funds to finance projects in the energy sector.

#### **3.2.3. Disfunctions, risks and vulnerabilities**

The fulfillment of the objectives of "The Energy Strategy of Romania" is affected by the existence of some disfunctions of the energy sector, the most important being the following:

##### **a) The imperfections of the institutional and legal framework**

Energy, as a infrastructure, was not recognized as such in importance after 1989, compared, for example, with the Transports and Communications and was "hidden" in the Ministry of Industry (Resources, Economy), although representing therein, according to many opinions, 80-90% of activities. Energy legislation is insufficient, unstable, and appeared late.

##### **b) Energy Strategy of Romania**

It is a document full of imperfections, developed by an "improvised" team, the sources of funding are unclear and the legal framework for achieving is questionable. It is criticized by the professional organizations of energy profile. After many experts view, "The Romania's



Energy Strategy” is not based on documented and transparent studies, but relies more on the type "round tables" discussions.

After the world energy crises of the 1970 world and 1980, when the oil production of OPEC countries was reduced, the mankind is facing in this period with a third energy crisis, this time much more serious, being determined by reducing the reserves, with simultaneous increase of consumption and increased pressure due to global warming. The aggressive increase of the price of hydrocarbons imposed to find and develop alternative sources of energy, but also to use more efficiently the conventional resources. In this context, the energy sector in Romania has had an inertial development, without significant reaction to these threats, which has depend the existing difficulties.

**c) Very low energy efficiency**

Although energy losses are very high (about 30-35% of primary resources) and also the energy intensity is the highest in the EU, the correction of these problems has been to a small extent, only inertially. The institution in charge (ARCE) and the legal framework (Law 199/2000 on energy efficiency) have not produced notable results.

**d) Centralized heating and co-generation**

Of the three subsystems of energy - electricity, natural gas, and urban energy - the last is in the most difficult situation. It is a priority sub-sector, with possibilities of many improvements, with a great social impact (85,000 blocks of flats, 3 million apartments, and 7 million lodgers), for which there is no clear responsibility and any specific national policy.

**e) Lack of investment in new production capacities**

Romania has old (with expired lifetime, 70% for thermoelectric power plants, and 40% hydropower plants) unsafe and inefficient production capacities. Only about 8% of capacities are new (units 1 and 2 of the Cernavoda nuclear power plant). The energy sector is characterized by a high inertia, respectively 4-15 years between the decision and the execution. At present, no major decisions are taken (with the exception of units 3 and 4 at Cernavoda, operational by 2014-2015), although there is the danger of a shortage of capacities for the production of energy and the disadvantageous import.

**f) Energy and social protection**

Romania has a developed and expensive system of an unfocused social protection (provided by the central budget and local budgets) compared to the affordability of energy bills. Since the final consumer pays all the energy losses, very little measures were taken to reduce these losses, and also the energy bills (for example, energy losses for blocks of flats represent 40-50% of heat consumed).

**g) The model for restructuring, the energy market and regulatory authorities**

The beneficial elements of these modern concepts in the Romanian energy sector, promoted by the EU, were strongly affected by the faulty behavior of the state as owner, by accepting a large proportion of incompetence, by the state and policy makers interference to facilitate preferentially the access to cheap energy (hydro and produced on lignite), with major damage to the detriment of national interest.

**h) The privatization of the energy sector** either is not done at all (in energy production), or in a questionable manner (in oil), in both cases being seriously affected the national interest.

**i) Lack of investment for the energy sector** has serious consequences in the perpetuation of difficulties arising from old and inefficient technologies, in increasing the progress and the competitiveness of the energy sector in Romania. There were always formal statements, but missing the decisions and financial and fiscal instruments. For example, for energy complexes Turceni, Rovinari and Craiova, which have an installed capacity of 4,240 MW and provide approximately 30% of the production of electricity in the country, the environmental investments amounting to 725 million by the year 2012, and another 1.3 billion Euros for modernizations, the sources of funding are unclear.

**j) The harmonization of the groups of interest in the energy sector**

There are a variety of (legal), groups of interest, most often in contradiction between them, which are present in the energy sector such as the government, parliament, the regulatory authorities, European and international agencies and institutions, manufacturers and suppliers of energy and energy services, energy consumers, owners, investors and banks, designers, manufacturers and producers of technology, employees, trade unions and civil society. The lack of a clear harmonization in the legal framework, of specific interests, favoring some over others, is likely to create serious conflicts.

"The Romania's Energy Strategy" states the following risks and vulnerabilities of the national energy sector:

- economically exploitable reserves of crude oil, natural gas and uranium, limited to the values outlined above, in circumstances that new significant deposits will not be discovered;
- volatility of oil prices on the international markets;
- the trend of change of the climate characteristics and the instability of hydrological regime;
- the possibility of negative effects on competition in the energy sector at European level, due to the trends of concentration of energy industry;
- a high pace of growth of energy demand in the context of the economic relaunching;
- the existence of arrears at the level of companies in the sector;
- the significant share of the population who have a high degree of vulnerability, in terms of using energy prices close to the average European ones;
- lack of effective fiscal instruments to support programs of investment in energy efficiency, develop co-generation based on the useful demand of heat, the use of renewable resources to produce heat and the development of energy services;
- possible blocking of the exploitation activity of hard coal as a result of the accumulation of historical debts;
- possible blocking of the exploitation activity of lignite as a result of the lack of specific regulations to ensure the better use in the public interest of the lignite reserves with a right and fair compensation of the land holders to develop the activity;
- selection, retention and motivation in the free-market condition of the human capital necessary to implement the strategy and for the safe operation of the national energy system;
- significant changes of the water level in the Danube due to climate change, which may lead to failure of cooling water at Cernavoda site for the safe operation of two nuclear power units;
- higher costs of operation of uranium ores due to variation of mineralization parameters and its discontinuity;
- opposition of the local authorities and of the territorial authorities with regard to accepting the opening of new production capacities in the exploitation of uranium ores;
- potential growth in the world price of uranium;
- the possible change in public attitude towards the construction of new nuclear power stations and deposits of radioactive waste;
- difficulties in providing system technological services during drought;
- additional costs resulting from the application of the provisions of Directive 2003/87/EC establishing a scheme for trading the emissions of greenhouse gases;

- reduced capacity to cope with terrorist actions directed against the energy producing units and transport systems (pipelines for crude oil, natural gas pipelines, electricity networks);
- a number of production, transportation and energy distribution facilities, partly obsolete and having outdated technology, with high consumption and operating costs, plants and equipment morally and physically used for the operation of lignite;
- a growing dependence on imports of natural gas, for the moment existing a single supplier;
- reduced energy efficiency of the production-transport-distribution-final consumption chain;
- organizing the electricity generation sectors based on the mono-fuel technology;
- reduced capacity of research, development and innovation in the energy sector and the mining sector;
- some units of electricity generation do not comply with the EU requirements for environmental protection; the alignment of these requirements require significant funding;
- incoherent policies to put in value the new premises for the operation of lignite.

### **Conclusions**

The objective of this research was the analysis of the balance between opportunities and risks generated by the new geoeconomical, geostrategic and geopolitical conditions and issuing directions for Romania's energy security strategy in a European and global context. Thus, the following conclusions have taken shape:

➤ Reviewing the strategy of energy policies is compulsory and should be centred especially on the security of energy supply;

➤ The aim is to **reduce Romania's dependence towards imports of energy resources**, and in the case of natural gas, **reducing dependency on a sole supplier** and **diversification of supply sources**;

➤ **Interconnecting** the national electric energy system with the one of other European countries in order to avoid the risk of power failures;

➤ An increased attention must be paid to the decision making process regarding the national energy system, taking into account its inertia (the time interval between the decision and the practical realisation being of approx. 4-20 years);

➤ **Stimulating investments** in order to update and streamline the energy sector (in all consumption sectors power losses are significantly high, 30-35%!!!) and also **reduce the negative impact on the environment**;

➤ **Creating a proper institutionalised setting** for the energy sector (for example, a Ministry of Energy and Resources) because dispersing activities related to the energy sector among various departments of different ministries is no longer a viable option.

Analysing the *structure of the national energy balance* leads to the following conclusive ideas:

➤ In general, Romania is a **country** that is **rich** (having at its disposal a wide range) in **poor** (small quantities) and **expensive** (in terms of extraction costs) **resources** and with a short assurance period, in terms of today's consumption rates (14-15 years for oil, 15 years for natural gas and 40-50 years for coal);

➤ **Coal remains the main fuel for producing electric energy in thermo-electric power stations** (with a contribution of at least 50%, for a long period of time, the rest being covered by hydro, nuclear and renewable energy sources). The fact that in a medium period of time the coal reserves will be depleted corroborated with their poor quality means that **Romania must import coal**;

➤ **Romania's primary resources balance is based in a percentage of 60-65% on hydrocarbons**, because the internal resources are undergoing a rapid depletion process, and **dependence on primary resources imports** (mostly hydrocarbons) has risen from 27.1% (in 2000) to approx. 36% (in 2005);

➤ The viability of **the nuclear power plant at Cernavodă to function at its full capacity** must be analysed extremely realistically (considering the specific risks of this type of power plant, the low quality and reserves of the uranium resources in our country, but also the advantages gained from rendering the other reactors operational).

Regarding *renewable energy* these are the conclusions:

➤ Romania holds the **largest percentage of renewable energy** (in the balance of primary energy consumption) **in Central and Eastern Europe**. Romania has at its disposal a relatively important economical to set up *hydro energetic* potential, a significant technical set up potential of *renewable resources*, *but practically unused*, *as well as an important agricultural and forest potential*.

➤ With the exception of *hydro energy* and *biomass*, the objectives set by the “National Strategy for Capitalising Renewable Sources” for capitalising other sources such as solar, wind and geothermal energy **can be assessed as being overrated**. However, wind energy seems to receive increasing attention both in the EU and in Romania.

➤ Also, with the exception of bio fuel, in Romania, generally speaking, **there aren't any specific incentives for developing renewable energy sources**.

➤ **Romania has at its disposal an important agricultural potential** for growing the raw materials necessary for fabricating **bio fuels**. The crops of rape, soya beans, sugar beet or sugary rice-corn are the most appropriate for the production of biodiesel and bio-ethanol. Growing rape or sugar beet will represent in the near future a business for Romanian farmers. Cheap workforce in comparison with the other EU countries, advantageous production costs and, last but not least, soil and climate, which are extremely important strong points, could transform Romania into an important player on the EU bio-fuels market.

**Romania can ensure from internal sources the quantity of bio fuels** recommended by the European Directive for 2010 and, in addition, have at its disposal a potential of raw materials large enough to produce 8% of the bio fuel needed in Europe. Also, the production of bio fuels offers **export opportunities** and represents an alternative for developing agriculture and takes advantage of the unused fields.

➤ Romania's most important potential is in agricultural **biomass**, not in wood, for which in Romania there aren't any organised practices for collecting.

In developed countries, the agricultural scraps are used in small co-generation units - installed at a commune level – with which the local energy requirement is ensured. This way, communes make inclusively waste management. Capitalising unused biomass production potential can become an important source of bio fuels and represents an important opportunity for Romania, especially in regard to rural development.

➤ Promotion of **production and bio fuels usage technologies at a farm level, in a decentralised system**;

➤ Bio fuel is increasingly perceived as an integrated element in a well defined system **ecologic-economic-social**.

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Analysing all the zone strategies/policies in order to evaluate them in terms of greenhouse gas emissions and evaluating the technical-economic potential to reduce them, at

the level of each ETS and non-ETS sector (knowing the fact that there is a considerable unused potential of increasing the energy efficiency and, by default, of reducing emissions of greenhouse gas, both in the electrical and thermal energy production as well as in the case of energy intensive industries), has led to the following observation:

➤ **No zone strategy is tackled today from the point of view of energy intensity indicators.**

None of the zone strategies and, especially, the one in the energy field don't contain analysis based on energy efficiency indicators or sector level carbon intensity (emissions reported to production, emissions reported to the sector's raw added value).

The economic prognosis model which is used should take into consideration the above mentioned indicators and, absolutely necessary, take into account scenarios regarding oil and, nonetheless, carbon price evolution on the European market of greenhouse gas emissions certificates.

➤ **The problems displayed above are complex, with long term effects, which require a political decision based on analysis carried out by a Centre or a specialised entity that would tackle the macroeconomic modelling in new terms, imposed by European policies in the fields of climatic change and energy.**

Such a Centre/entity would have the possibility to cooperate better with similar European institutions. Political decisions should be based on studies made by a specially created Centre, highly professional, with complex interdisciplinary competence. Regardless of the current expertise of civil servants in various ministries, such analysis cannot be carried out by them. The Government's involvement, at the level of the Prime Minister's Cabinet is necessary for tracking the results of macro modelling made in a prognosis Centre.

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Conclusions regarding the **regional geopolitical environment** in relation with energy security:

➤ The Caspian Sea Area is no longer an alternative exclusive towards the Middle East, in terms of supplying energy resources; both regions are characterised by political instability and are affected by armed conflicts (U.S.A vs. Iraq in the Persian Gulf, Russia vs. Georgia in the Caucasian-Caspian space).

➤ Although Romania presents certain advantages from an economic, technical and geopolitical point of view regarding the transit of Caspian energy through our country (the oil pipeline infrastructure is mainly built, the surplus refining capacity, the largest refinery in the Black Sea Basin - Midia-Năvodari, the largest Black Sea harbour, Constanța, the extremely permissive topographic space which doesn't require a considerable amount of pumping units, lack of hot spots), before reaching its large Western consumers, the convergence of the interests of the main powers in this space (U.S.A, China, main European powers and Russia's geostrategic games) result in not capitalising them.

➤ Russia's show of force against Georgia (the 2008 war) lead to increased reticence of Caspian Sea riverside countries (Azerbaijan, Kazakhstan and others) to participate in consortiums with Western partners in detriment of their Russian ones.

➤ The increase in vulnerability of natural gas supply, considering Russia's intention (already monopolistic in terms of gas supply to Europe) to create an "OPEC" like structure in this domain, further limiting the European alternatives (few anyway), by inviting in this cartel Iran and other countries from North Africa.

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Taking into consideration the results obtained, synthesized and essentially presented in conclusions above, we consider the objectives proposed in the context of the research necessary for creating this study fully accomplished. Also, we consider that, following the scientific analysis, the main directions of our countries' position regarding energy security

have been drawn. This is a domain of the utmost importance both for Europe and the world, and the recent high level meetings in the European Council (15-16 October 2008), where the idea that “the security of energy supply is a priority for the European Union” has been restated, stand as proof. Moreover, the conclusions of the European Council from October 2008 restated the idea that the “security of energy supply is a priority for the European Union”. In this respect, the guidelines defined in the framework of the Council regard the diversification of energy sources, developing crisis mechanisms to deal with disruptions to supplies, strengthening critical infrastructure, especially trans-European energy transport networks, as well as developing the Union’s relations with producer and transit countries with a view to securing stability of supply.

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