

Romanian Energetic Policy Concerning the Biofuels usage as an Alternative Energy Source

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Abstract

In the view of limiting the global temperature increasing, the green house emissions respectively, Romania has to act immediately, especially in the energetic efficiency field and of energetic renewable sources. The actions regarding the energetic efficiency and the energetic renewable sources will contribute both at diminishing the negative pollutions impact on the environment and at limiting of Romania dependency for the energy import. The reinforcement of developing conditions for the biofuel sector in Europe has been materialized by drawing up the Directive 2003/30/CE, having as target the promoting of biofuels usage in transport. That directive provides the introduction on the market by each EU member state of a minimum production of biofuels and other renewable fuels, calculated on the base of the energy contained of all types of petrol and diesel used in transport. This directive has been transposed in Romanian legislation by the Governmental Decision no. 1844/2005, concerning the promoting of biofuels and other renewable fuels usage in transport, completed and rectified by the Governmental Decision no. 456/2007 which stipulates a phasing for introduction on the Romanian market of the blended biofuels and conventional fuels.

Key words: *energetic policy, renewable energy, biofuel, biomass, sustainable development.*

1. Introduction

The EU Biofuels Directive aims at promoting the use of biofuels or other renewable fuels in order to replace fossil diesel or petrol for transport purposes in each Member State (Art.1). The significance for biofuel and biomass in accordance with this Directive is (Directive 2003/30/EC):

- Biofuels – means liquid or gaseous fuel for transport produced from biomass;
- Biomass – means the biodegradable fraction of products, waste and residues from agriculture (including vegetal and animal substances), forestry and related industries, as well as the biodegradable fraction of industrial and municipal waste;

The use of biofuels for transport (pure biofuels or blending components in the conventional fuels) is one of the measures taken by the EU to comply with the climate change commitments of the Kyoto Protocol (reduction of greenhouse gas emissions) and one of the steps towards a wider application of biomass, which will enable biofuel to be more extensively developed in the future, still not excluding other options, like the hydrogen option. The provision of the nine articles is focused on three main points: the list of biofuels (bioethanol, biodiesel, biogas, bio-methanol, biodimethylether, bio-ETBE produced on the basis of bioethanol, bio-MTBE

produced on the basis of biomethanol, synthetic biofuels, biohydrogen, pure vegetable oil), the percentage of renewable contents, and the schedule for introducing biofuels in the transport fuel market (Directive 2003/30/EC).

Thus, the Romanian biofuels market (focus on biodiesel production benefits from a new legislative act (GD 1844/2005) in compliance with the EU Directive 30/2003, from economic strategies realized by state and non-state actors, regarding the production of biofuels, from private investments in refineries and raw materials, from foreign expertise studies and practices that contribute to the creation of a flexible market frame ((ARCE Document 2005). The following section will analyze the regulatory framework for the development of the biofuels sector in Romania, focusing on the compliance with the EU regulation.

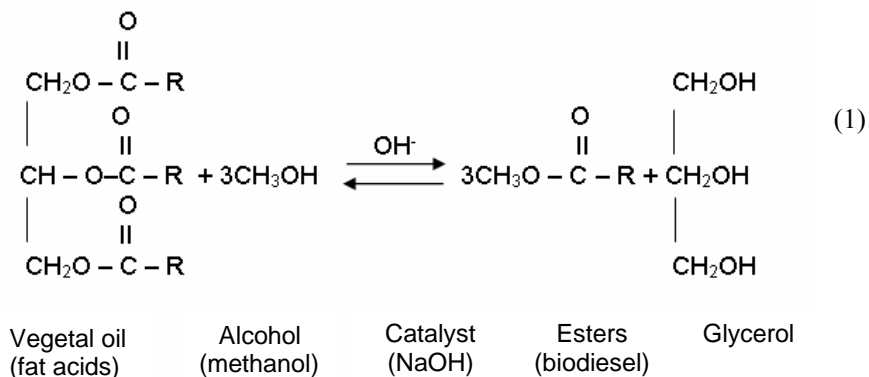
2. Biofuels and the achieving methods

The European biofuels sector contains two distinct categories: bioethanol and biodiesel. Bioethanol has been achieved by beet, corn, barley or wheat fermentation, which sugar content is converted into alcohol. Bioethanol can be directly used as petrol additive or as ETBE (ethyl-tertio-butyl-ether). Biodiesel (fat acids methyl-ester) has been achieved from rape seeds or sunflower seeds in the view of its usage as diesel fuel additive.

The products considered biofuels are (Governmental Decision 2005):

- Bioethanol – ethanol produced from biomass and/or the biodegradable fraction of waste, to be used as biofuel;
- Biodiesel – a methyl-ester produced from vegetable or animal oil, of diesel quality, to be used as biofuel;
- Biogas – a fuel gas produced from biomass and/or from the biodegradable fraction of waste that can be purified to natural gas quality, to be used as biofuel, or woodgas;
- Biomethanol – methanol produced from biomass, to be used as biofuel;
- Biodimethylether – dimethylether produced from biomass, to be used as biofuel;
- Bio-ETBE (ethyl-tertio-butyl-ether) – ETBE produced on the basis of bioethanol. The percentage by volume of bio-ETBE that is calculated as biofuel is 47 %;
- Bio-MTBE (methyl-tertio-butyl-ether): a fuel produced on the basis of biomethanol. The percentage by volume of bio- MTBE that is calculated as biofuel is 36 %;
- Synthetic biofuels synthetic hydrocarbons or mixtures of synthetic hydrocarbons, which have been produced from biomass;
- Biohydrogen - hydrogen produced from biomass, and/or from the biodegradable fraction of waste, to be used as biofuel;
- Pure vegetable oil - oil produced from oil plants through pressing, extraction or comparable procedures, crude or refined but chemically unmodified, when compatible with the type of engines involved and the corresponding emission requirements.

Biodiesel has been achieved from a chemical reaction (1) called transesterification. The raw material that is made up of triglyceride, reacts with an alcohol, usually methanol, in the presence of a catalyst (NaOH). The products of this reaction are esters (methyl-esters if the methanol is used) and glycerol. The chemical reaction for biodiesel achieving is presented below:



The vegetable oil is preheated in a preheating basin, at temperature of 40⁰C. After that it is transferred into a reactor. Methanol and sodium hydroxide are blended in another vessel, eventually by air barbotage, until the sodium hydroxide is completely dissolved, after that this miscellany is pumped into the reactor where the esterification reaction takes place. The blend of vegetable oil and methoxide from the reactor is mixed and heated at temperature of 55⁰-58⁰C, after that the resulted miscellany is pumped into decantation basins and it is let there for a while (~24 hours) when the biodiesel and glycerine split up takes place. Hence, the glycerine is pumped into the storage basin. The technological process is presented in the Figure 1.

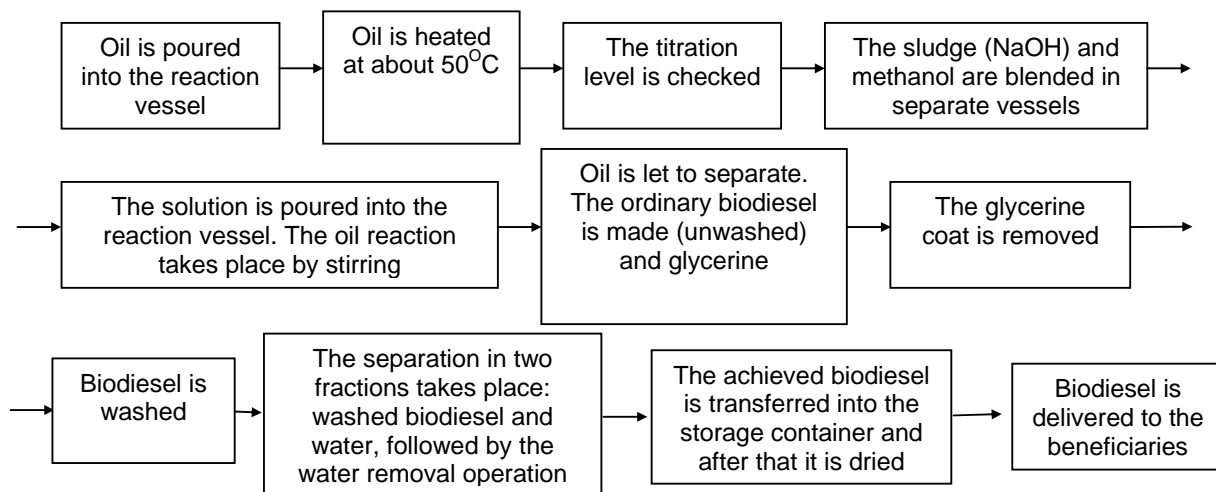


Fig. 1. Biodiesel production flux.

The new vegetable fuels obtained from agriculture and organic materials insure significant advantages in the transportation field and in agriculture. These fuels reduced the emission of the pollutants based on carbon monoxide, in accordance with the engagement of the European Union stipulated in the Kyoto Agreement.

3. Specific legislation concerning the biofuels usage

Since at the beginning of 1990, in Europe has been a regulatory framework regarding the biofuels development. The first measures were drawn up in 1992 within The Common Agricultural Policy giving the Member States the possibility of growing up the non-food crops and taxes exemption for biofuels. In 2001 the Commission adopted a Communicate concerning the alternatives for biofuels destined to auto transport being identified three categories of fuels: biofuels, natural gas and hydrogen. This action has been accompanied by legislative proposals that requested the Member States to promote biofuels ((ARCE Document).

Thus, the reinforcement of the development conditions of the biofuels sector in Europa has been concretised by the reinforcement of developing conditions for the biofuel sector in Europe has been materialized by drawing up the Directive 2003/30/CE, having as target the promoting of biofuels usage in transport. This directive provides the introduction on the market by each EU Member State, of a minimum biofuels and other fuels production.

The transposition of the Biofuels Directive into Romanian law was made by the Governmental Decision no. 1844/2005, completed and modified by the Governmental Decision no. 456/2007 which stipulates a phasing for introduction on the Romanian market of a minimum percent of biofuels in conventional fuels, as fallows (Romanian Energy Policy 2005):

- Since 1st July 2007, diesel with a minimum biofuel content of 2% in volume;
- Since 1st January 2008, diesel with a minimal biofuel content of 3% in volume;
- Since 1st of July 2008, diesel with a minimal biofuel content of 4% in volume;
- Since 1st of July 2009, diesel with a minimal biofuel content of 4% in volume;

The market introduction of this kind of biofuels has to respect the conditions stipulated by the Governmental Decision no. 689/2004 concerning the conditions establishment of the market introduction of petrol and diesel, with ulterior supplements and modifications.

Transposing Art.3 of the Directive 2003/30/EC, the legally established authority to monitor the effect of the use of biofuels in diesel blends above 5%, to inform and take measures to ensure compliance with the relevant Community legislation on emission standards, and to ensure that information is given to the public on the availability of biofuels and other renewable fuels, is the Romanian Ministry of Economy and Finances (GD no. 1844/2005, Art. 6 and 7) (Governmental Decision no.1844 2005).

The same ministry will report to the Commission, according to the Art. 4 of the Biofuels Directive, any differentiation of the national targets compared to the reference values mentioned above, which could be based on objective factors (e.g. limited national potential for production of biofuels from biomass), on the amount of resources allocated to the production of biomass for other energy uses than transport, on the specific technical or climatic characteristics of the transport fuels market, or on the national policies allocating comparable resources to the production of other transport fuels based on RES (GD, Art. 9).

The last article of the Romanian law on biofuels gives the Minister of Economy and Finances the possibility to make the necessary modifications in the list of biofuels, given the fact that the progress of technology and the evaluation of the environmental impact of biofuels might change the provision regarding the list (GD, Art. 10) (Romanian Energy Policy 2005). Romanian also took a series of actions in order to contribute to the promotion of the use of biofuels or other renewable fuels. In this context we mention:

- The introduction in the Fiscal Code of an excise exemption for the energy products like biofuels and other renewable fuels. This provision made the object of the article 201, letter 1 from Law no. 571/2003 concerning the Fiscal Code, amended and completed by the

Law 343/2006 (Legea 571/2003). The methodological standards of implementation of the new Fiscal Code are being approved by the Government Decision, no. 1861/21.12.2006.

▪ The Government Ordinance no. 44/2006 concerning the modification of the Emergency Government Ordinance no. 25/2006 for approving the level of support granted to the agricultural producers for buying diesel in order to make the mechanized agricultural works for setting up and maintaining of some agricultural crops that are starting in the spring of the 2006 (Emergency Government Ordinance 2006).

In accordance with the article 1, paragraph (1), in order to start the activities for the development of the crops, made in the autumn of the 2006, it is given to the agricultural producers a financial support of one leu/litre for buying diesel and used biodiesel.

4. Romanian state concerning the biofuels production

In the geographical environment condition it is being appreciate that Romania has a raised biomass energy potential, evaluated of about 7,594 thousands toe/year (318×10^9 MJ/year), which represents almost 19% from the entire consumption of raw material at the level of 2000, shared in the following categories of fuels (Governmental Decision 2003):

- Residues from forest plants and fire wood - 1.175 thousands toe/year ($49,8 \times 10^9$ MJ/year);
- Wood wastage – sawdust and other short wood ends – 487 thousands toe ($20,4 \times 10^9$ MJ/year);
- Agricultural wastage from cereals, steam maize, vegetable residues of grape – 4,799 thousands toe ($200,9 \times 10^9$ MJ/year);
- Biofuel – 588 thousands toe ($24,6 \times 10^9$ MJ/year);
- Wastage and municipal waste – 545 thousands toe ($22,8 \times 10^9$ MJ/year)

The biomass is the main agricultural fuel being used especially for heating the place and the water and also for cooking. The biomass represents 7% from the primary energy request and 50% from the Romanian means of renewable resources. Taking into account the quantities of fuel appreciated to be use annual, it results that is necessary to assure a quantity of biofuels of about 300 thousands t/year, for 2010.

The Romanian means to supply the necessary quantity, meaning vegetable oil (sun flower, soy, rape) is about 500-550 thousands t/year, which allows the achievement of a similar level of biodiesel production (about 500-550 thousands t/year).

At the beginning of 2007 there are operative on the market biofuel producers and in the next period there will be put in action new capacities of production. There is also some interest for building new means of production in the next years. Based on the information provided by the stakeholders and from their discussions it can be appreciated that Romania can dispose of a capacity production of about 400 thousands tones/year for biodiesel and about 50 thousands tones/year for bioethanol at the end of 2008.

In this way, they are been assured the premises of reaching the target of 10% of biofuels for 2020, calculated on the base of the energy contained of all types of petrol and diesel used in transport, target included in the package of energy measures for energy approved by the European Council (march 2007).

The means of assuring the raw material can be provided by biodiesel (rape seed, sun flower, and soy) and by bioethanol (maize, sugar, beet, potatoes, residues from forest plants and fire wood).

The atmospheric pollution diminishing represents the main purpose in promoting the biofuels or other renewable fuels usage in order to replace the petrol and diesel used in transport. Romanian targets in this field are the following (Romanian Energy Policy 2005):

- In the course of 2007, it will be assured on the fuels market, the biofuels and other renewable fuels usage in rate of at least 2% from the total of the energetic content of all petrol and diesel types used in transport;
- Up to the end of 2010, the biofuels rate will be of at least 5.75%.
- Up to the end of 2020, the minimum compulsory biofuels rate will be 10% from the total petrol and diesel consumption for the transport.

The regions with high potential regarding the rapeseed crop are presented in the Figure 2.

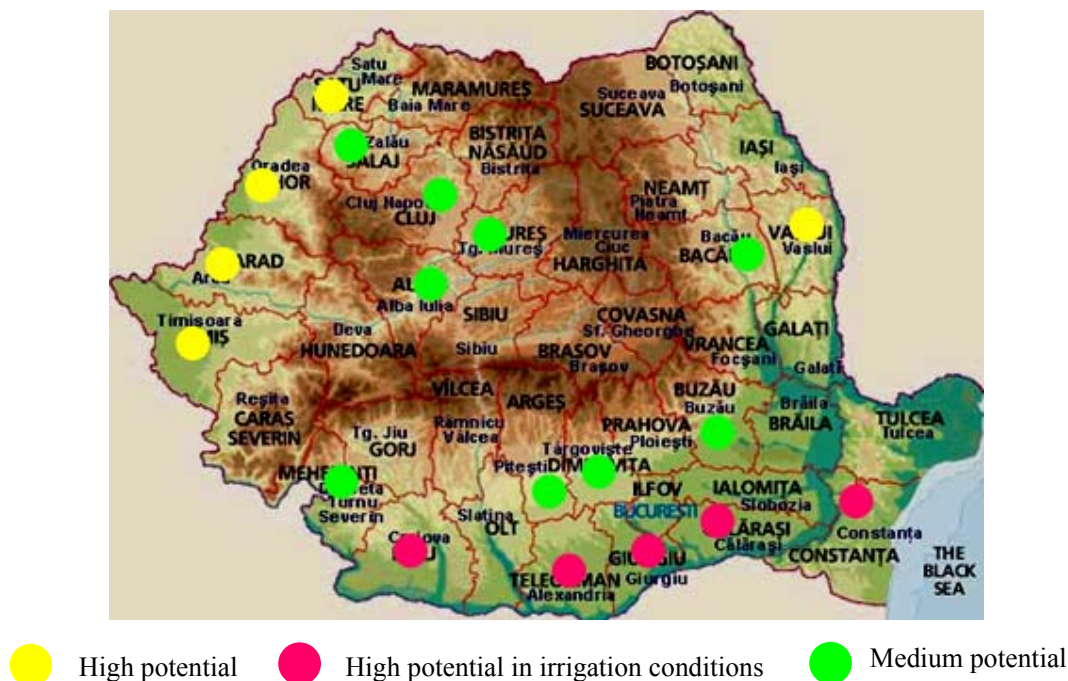


Fig. 2. The regions with high potential regarding the rapeseed crop. [Source: Ministry of Agriculture, Forests and Region Development].

For Romanian industry the biodiesel production is a novelty element. The European directives requirements and Romanian legislation provision in this field will encourage the biodiesel production and businesses related to this field. By promoting the oleaginous crops (rapeseed crop is a very advantageous one), Romania has the chance to become one of the greatest biofuels producers in Europe.

Since 2007 the biofuels producers have become very operational on the market and it is further followed the application of new production capacities as well as discovery of new production means for the next years.

It is assumed that until the end of 2008, Romania will be having a biodiesel production capacity of about 400 000 tones/year and a bioethanol capacity of about 50 000 tones/year. Taking this into account, it is estimated that the target of 10% of biofuels will be reached for 2010, calculated on the base of the energy contained of all types of petrol and diesel used in transport.

In 2006, Romania produced an amount of 3200 tones of biodiesel. Biodiesel is a little more leaned than diesel the point of view of carbon content (-8.98 %) and of hydrogen content (-0.79 %). It is observable that, the oxygen (about 10%) is present in the biodiesel structure favouring the burning process in the engine. As well, the total sulphur lack is remarked which conducts to the chemical pollution diminishing.

By comparison the physical-chemical characteristics of the fuel obtained from vegetable oil and those of the classic fuel (diesel), the qualities of the new one could be observed (Table 1).

Table 1. The physical-chemical characteristics of the fuels obtained from vegetable oil and diesel (Emergency Government Ordinance no. 25/2006)

Physical – chemical characteristics	Oilseed rape	Biodiesel	Diesel
Density at 20°C [kg/dm ³]	0,92	0,88	0,84
Kinematic viscosity at 20°C [mm ² /s]	74	6,30	4...6
Inflammability [°C]	317	184	80
Cetane number	40	51	50
Caloric power [MJ/kg]	37,6	37	41,8

Based on these characteristics, the so called vegetable oils as well as the fuels usage is possible through some engine bulging modifications achievement (bigger injection pressure, usage of some heating systems in the nourishment cycle, usage of a distributor and of a supplementary fuel reservoir for the starting using diesel, so on).

In Romania, in the view of biodiesel achieving, an instalation has to detain consisting with the Ordinance 860/2002 with ulterior rectifications and completations, an environmental agreement provided by the regional environmental authority (Ordinance no 860/2002), as a previous stage for the requirement of the environmental integrated permit (Emergency Governmental Ordinance no. 152/2005).

As well, for getting the right for biodiesel installation exploiting the economical enterprisers need an environmental integrated permit for which they have to follow the emission procedures in accordance with the Emergency Governmental Ordinance no 152/2005 provision (Emergency Governmental Ordinance no. 152/2005)..

5. Conclusions

In Romania, the Ministry of Economy and Finances has the responsibility for monitoring the effect of biofuels blended with diesel in proportion of over 5% in volume usage for the non-adapted autovehicles. It also has to inform the competent authorities regarding the environmental legislation observation concerning the emissions standards and also to inform the public about the advantages of biofuels and other renewable fuels usage.

Biofuels usage represents many economical, environmental protection and human health advantages within the context of sustainable development, thus:

- Biofuels contribute to the substantial diminishing of unburned hydrocarbon emissions, carbon monoxide and suspension particles emissions, of greenhouse gases emissions;
- Biodiesel reduces the carbon dioxide emissions with almost 90%, the sulphur emission with almost 98%;
- Biofuels usage decreases the fossil fuels dependency;
- Biofuels contributes to the soil and underground waters protection by using the biodegradable products;
- Biofuels generates indirectly new jobs and open new markets for the agricultural production;
- Biofuels contribute to the energy sources diversification and to enhancing of renewable energetic categories sources.

Political and legislative directions have been developed in order to enhance the efficiency of the achieved overtures in the fuels production and their usage in transport, keeping as a coordinating line the sustainable development concept.

The biofuel and the crude oil used as fuels for the Diesel engine represent a future opportunity for European countries. If the energetic parameters decrease the average rate is acceptable and the benefit consists in a significant pollutants reduction.

From the economic point of view the energetic crops (rapeseed, sun flower, etc.) represent an opportunity to increase the farms efficiency. There also the other benefits regarding the secondary products result from biofuel technology production: food for beef, glycerine for pharmaceutical industry; a new industry branch will be started with important social effects.

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Politica energetică românească privind utilizarea biocombustibililor ca sursă de energie alternativă

Rezumat

În vederea limitării creșterii temperaturii globale, respective a emisiilor cu efect de seră, România trebuie să acționeze imediat, în special în domeniul eficienței energetice și a surselor regenerabile de energie. Acțiunile privind eficiența energetică și sursele de energie regenerabilă vor contribui atât la reducerea impactului negativ al poluării asupra mediului cât și la limitarea dependenței României de importul de energie. Întărirea condițiilor de dezvoltare a sectorului biocombustibililor în Europa a fost materializată prin elaborarea Directivei 2003/30/CE având ca scop promovarea utilizării biocombustibililor în transport. Această directivă prevede introducerea pe piață de către fiecare Stat Membru a

unei producții minime de biocombustibil și alți combustibili regenerabili, calculate pe baza energiei conținută de toate tipurile de benzină și motorină utilizate în transport.

Această directivă a fost transpusă în legislația din România prin Hotărârea de Guvern nr. 1844/2005, privind promovarea biocombustibililor și a altor combustibili regenerabili utilizați în transport completată și modificată de Hotărârea de Guvern nr.456/2007 care stipulează o fază pentru introducerea pe piața românească a biocombustibililor în amestec cu combustibilii convenționali.