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BIOFUELS IN TRANSPORT SECTOR OF LATVIA: EXPERIENCE, CURRENT STATUS AND BARRIERS

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During the last 10 years biofuel production and utilization in the European Union have become more extensive owing to support provided by the relevant EU Directives. Achievement of the main targets defined by Directives was not simple, being confronted with various barriers. Latvia is one of the EU member-countries that have set an ambitious goal as to the production of biofuel and its use in transport. The authors summarize the major achievements of the country in this area and analyze the main barriers to implementation of biofuels in the transport sector, providing an outlook on the current status of the bioenergy and the transport situation in Latvia.

Keywords: *biofuels, transport, bioenergy policy.*

1. INTRODUCTION

Nowadays the transport sector plays an important role in development of every country, but it also consumes significant amount of energy, being also the main source of environmental pollution due to using basically fossil fuels. In the last years, much attention has been given to these problems, and new types of alternative fuels (bioethanol, biodiesel, etc.) are now offered. Some of these biofuels already occupy a definite share on the market, but it is still insufficient to overcome the problem of environmental pollution from transport; therefore, the dependence on fossil fuels remains. Since the EU is almost 98% dependent on the fossil fuel sources and 30% of its consumption falls on transport, this problem has to receive much more attention in the future [1].

In order to solve the mentioned problem, Directive 2003/30/EC [2] of the European Parliament and European Council on the promotion of the use of biofuels and other renewable fuels for transport was accepted also in Latvia almost 10 years ago. The Directive set a target of additional substitution of biofuel for conventional transport fuels in the time span from 2005 to the end of 2010, and Latvia took on the obligation to attain this target in the framework of ”Biofuel production and use in Latvia (2003-2010)”, which however has not been achieved in full measure.

Now, more actual for Latvia is a new Renewable Energy Directive (2009/28/EC), which is amending and subsequently repealing Directive 2003/30/EC [3], and which defines the framework for use of energy from renewable sources promoting also cleaner transport. Latvia has also defined the

target numbers in National Renewable Energy Action Plan (nREAP) for the next period and accepted the obligation to increase the share of renewable energy in the transport sector up to 10% of gross final energy consumption in transport by 2020 [4].

Successes in realization of the set targets strongly depend on various factors. The main progressive innovation is adoption of biofuel sustainability criteria that would impel biofuel producers to contribute to the environmentally responsible production strategies [5]. The next one is the stimulation of the use of biofuels in transport. Fulfilment of this target is still affected by economic, legislative and informative barriers, which have not been fully overcome during the implementation of Directive 2003/30/EC and retard the enforcement of biofuel use in the transport sector. As the agriculture, industry and transport in Latvia are fully dependent on imported fuels, successful development of biofuels is highly important for our country in the future.

The paper provides an outlook on the development of biofuel industry and supporting schemes for biofuel production and usage in Latvia, estimates the current status of bioenergy and the transport situation in the country, analyzes the main barriers to the implementation of biofuels for transport as well as gives recommendations for overcoming these barriers in the future.

2. DEVELOPMENT OF BIOFUEL INDUSTRY

Development and use of liquid biofuels for transport were initiated in 2004 – after the Republic of Latvia had joined the European Union (EU). The first biodiesel plant was built earlier (in November 2001) with the working capacity only 2.5 thd. tonnes of biodiesel (rapeseed methyl ether) per year [6]. In December 2003, the programme ”Biofuel production and use in Latvia (2003-2010)” was approved, the main target of which was promotion of biofuel production and use in Latvia, realizing at the same time the EU target set by Directive 2003/30/EC to reach the 5.75% share of renewable energy in the transport sector by 2010. This Directive was an important stimulus to strengthen the agricultural sector and reduce dependence on the imported energy. Approximate control figures for production of biofuel in Latvia and prognoses for the years 2004-2010 were set in the programme ”Biofuel production and use in Latvia (2003-2010)”; thus beginning was made for a new production sector in Latvia. More rapid development in the sector started in April 2005, when the government accepted the Law on Biofuels. In cooperation with non-governmental organizations, the strategy of implementation of the relevant law on biofuels was developed and accepted by the Cabinet of Ministers. To ensure its compliance with the requirements of the Directive 2003/30/EC, the necessary normative acts were adopted which regulated the quality requirements, the procedure for granting support, as well as compliance assessment, consumer notification and market monitoring conditions for biofuels and biofuel-fossil fuel mixes. The number of production facilities and their capacity started to increase, and in 2007 there were seven biodiesel production companies with a capacity of 150 thd. t/a, with the maximum of production capacities in the biodiesel sector reached in 2009, when the largest biodiesel company in Latvia – ”Bioventa Ltd.” (~100 thd. t/a) – started operation. During the following few years the market stabilized, and only six biodiesel companies and

two ethanol companies were left as producers of biofuel. Not all of them managed their business activities for the real market conditions without state support; therefore, the total production capacities dwindled after the end of Support Programme, reaching the total production capacity of 173 thd. t/a in the biodiesel sector and 25 thd. t/a in the ethanol sector in 2011 [4]. At that time only some of them kept production on the same level and found customers for the fuel sale. The programme did not provide for the use of biogas in transport but only for gas engines at CHP (heat & power) plants. Therefore, the use of biogas in transport was not realized at all.

Further production and use of biofuels are strongly connected with Directive 2009/28/EC. Latvia has also defined the target numbers in nREAP [7] and accepted the increase in its share of renewable energy up to 10% of gross final energy consumption for transport by 2020. The corresponding calculations were performed by organizations associated with Ministries in order to find indicative numbers for each year for achieving the targets prescribed by Directive 2009/28/EC (Table 1).

Table 1

National 2020 target numbers and forecast of total contribution from each renewable energy technology for meeting Directive 2009/28/EC on the share of renewables in transport (thd. t)

	2005	2010	2012	2014	2016	2018	2020
National target for renewable energy share in transport	0.9%	4%	4.2%	4.5%	5.5%	7.2%	10%
Bioethanol and bio-ETBE	0	14	17	19	20	22	18
Imports	0	0	0	0	0	0	9
Biodiesel	3	25	25	22	20	22	28
Imports	0	0	0	0	0	1	8
Total renewable electrical energy	4	3	3	4	5	5	6
Vehicular transport	1	1	1	2	2	2	2
Other transport	3	2	2	2	3	3	4
Others (biogas, vegetable oil, etc.)	0	0	1	6	19	31	31

The prognosis gave increase in renewables for the transport sector of Latvia from 42 ktoe in 2010 to 83 ktoe in 2020, putting attention on the utilization of first- and second-generation biofuels in the vehicular transport [7]. Rapid growth was predicted for gaseous biofuels, the use of which could be realized due to the planned development of biogas stations in Latvia. Some proportion of biofuels was planned to import so as to realize the indicative target in full measure.

3. ENERGY SECTOR

Currently, the energy sector of Latvia depends mainly on the imported fossil fuels. Over the years, the composition of suppliers has not changed much, although recently the import from EU countries has increased. For example, in 2011 about 66% of all fuels were imported from EU countries, and 30% – from non-EU countries, with only 4% (mainly biodiesel) produced in Latvia [8]. The fuels mainly imported from the non-EU countries are diesel (~ 67% of the total diesel

amount), and petrol – from EU countries (~ 99% of the total petrol amount). Not all this amount of fuels was consumed in Latvia: ~ 1/3 was sent afterwards to other EU countries.

The greatest proportion of imported fuels left in the country was consumed directly in the transport sector. The consumption of diesel fuel has a tendency to increase in the last years; the use of biofuel mixes was also observed, with biofuel content of total being in the range 5-30%. However, the amount of fuel mixes with such biofuel content is negligible, and do not impact particularly the total amount of consumed diesel fuel, the consumption of which is expected to increase also in the future. The changes in the fuel consumption in Latvia are shown in Fig. 1.

The economic crisis in 2008 led to serious changes also on the fuel market and made corrections in the total amount of consumed fossil fuels – it decreased together with incomes of the commercial sector; as a result, the number of transport units also decreased.

Despite the efforts of the government as to promotion of biofuels, the amounts of consumed biofuels did not increase rapidly and are still very small compared to fossil fuels (see Fig. 1).

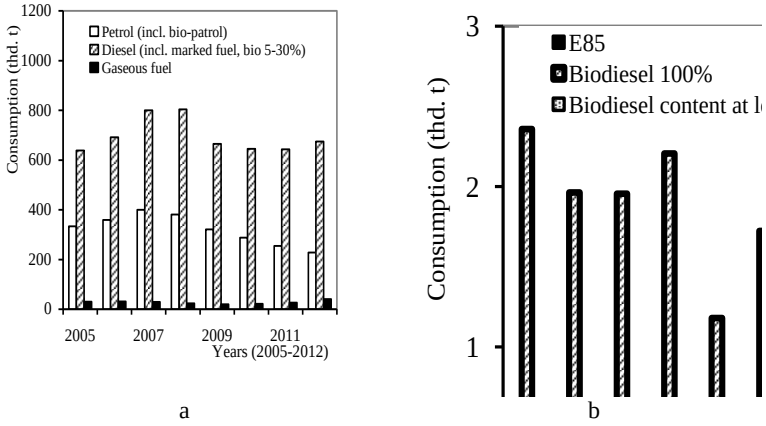


Fig.1. The total fuel consumption in transport (Latvia, 2005-2012) for:
a - mixes with low biofuel content;
b - biofuels and mixes, retail sale (biofuel content ≥30%).

From biofuels, the 100% biodiesel was mostly consumed, which is connected with the possibility to buy this fuel at the retail stations as well as with greater interest in this fuel demonstrated by some private companies. The number of fuel stations in 2011 was 624 (85 LPG stations, 487 fuel stations, 52 LPG fuel stations), whereas biodiesel and E85 (85% ethanol - 15% petrol mix) could be bought only at few of them.

4. DIRECT AND INDIRECT STATE SUPPORT

During that time, different supporting schemes for promotion of biofuels were realized (mainly adopted from other EU countries). For the most part, production was promoted by implementation of the State aid programme, which allowed biofuel producers to receive granted aid for production of the annual

minimum amount of biofuels. Such type of support was the main tool in achieving the indicative numbers defined by the biofuel programme. However, only biodiesel was produced in the prescribed volumes, while the amount of produced bioethanol was half as much as expected. The main reason for that is low consumption of bioethanol due to a small number of transport units which use E85 fuel.

In order to achieve the indicative numbers of Directive 2003/30/EC, the mandatory admixture of 5% biofuel in fossil fuel was implemented in October 2009, which allowed increasing the biofuel share in the total fuels consumed in transport sector from 0.48% in 2009 to 2.6% in 2010 (Fig. 2) [4].

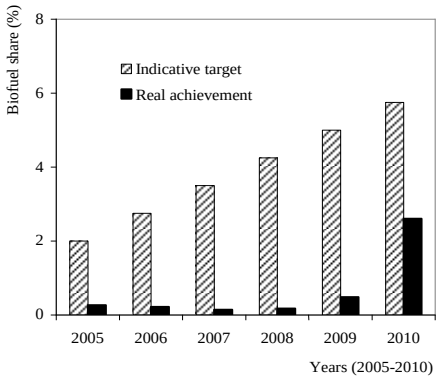


Fig. 2. Indicative target and real achievement during realization of EU Directive 2003/30/EC on biofuel in Latvia.

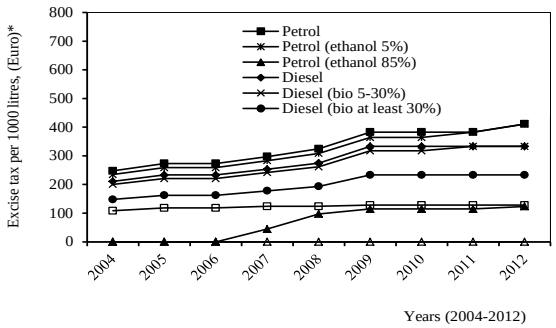
The analysis of support schemes evidence that the previously realized support of biofuels producers was not effective enough. Almost 96 million € were invested in the development of biofuel industry in the form of direct State Aid for the years 2006-2011, which does not allow reaching the indicative numbers of Directive 2003/30/EC; consequently, new solutions are to be found.

The impact of State Aid programme was determinant for developing the biofuel production sector. Indeed, after this had been completed by the end of 2010, a decrease in the bioethanol production capacities was observed – mainly due to problems with finding customers. The sale of produced fuel was affected by different factors. First of all, it was a lack of customers and fuel stations that would sell fuel with the biofuel content larger than mandatory admixture (e.g. E85), which did not allowed increasing the sale of bioethanol. The sale was also affected by changes in the import and export areas. Local fuel companies started to increase import of fossil fuel with mandatory admixture of 5% biofuel from the oil refining companies outside Latvia. Totally, the exports of bioethanol decreased by 28.6% while its imports increased by 169.9% [4].

Apart from the direct State aid, the indirect aid was also realized in the form of reduced rates of the excise tax. According to these regulations, biodiesel and bioethanol were set free from excise tax for the volume in which the corresponding biofuel is added to the fossil fuel (diesel or petrol). In order to promote the use of biodiesel fuels and blends with fossil diesel, a reduced excise rate was enforced in the Law “On Excise Duties” for blends containing 5-30% vol. of biodiesel, for

blends containing ≥30% vol. of biodiesel, and for 100% biodiesel for which the excise tax is zero. Such a zero tax is also applicable for rapeseed oil used as fuel. The excise tax was decreased also for petrol containing 5.0% bioethanol and 85% bioethanol (E85). Starting from 2011 the reduced excise tax for fossil fuels with admixture about 5% was cancelled, with the same level of excise tax remained as for the 100% fossil fuel. The excise tax for fossil fuels in Latvia makes up in the retail price: 31% for E95 fuel, 26% for diesel and 13% for LPG (data on 06.09.2013.) [9]; therefore, any reduction in this tax significantly affects the final price of fuels.

Due to increase in the price of imported fossil fuels on the global market and taking into account the economic situation in the country, the excise tax for all fossil fuels as well as for biofuels was not the same, growing up in the last years (Fig. 3).



*Applied LVL/EUR exchange rate=0.7028

Fig. 3. Changes in the excise tax for different fuels sold in Latvia (2004-2012).

Despite the difference in excise taxes between fossil fuels and biofuels, the final price of biofuels did not attract potential customers – e.g. the price of 100% biodiesel at the retail fuel stations being only about 4-7% lower as compared with the price of conventional diesel fuel at a fuel station.

In order to achieve the targets defined in nREAP, more attention has to be paid to promoting the use of biofuels in the transport sector. While the biofuel production can be compensated by import of biofuels from other EU countries or also from those outside EU (if the EU production level is insufficient), its use can be stimulated only by effective legislative measures. Latvia decided to realize promotion of biofuels by admixing them in small amounts to conventional fossil fuel which later has to be sold in the market. This is the best measure for reaching the nREAP target since it allows forecast of approximate volumes of biofuel consumption in the market. However, the promotion of pure biofuels (biodiesel, pure oil) or blends with higher content of biofuel (e.g. E85) is not effective, as the consumers have no stimulus to use such fuels.

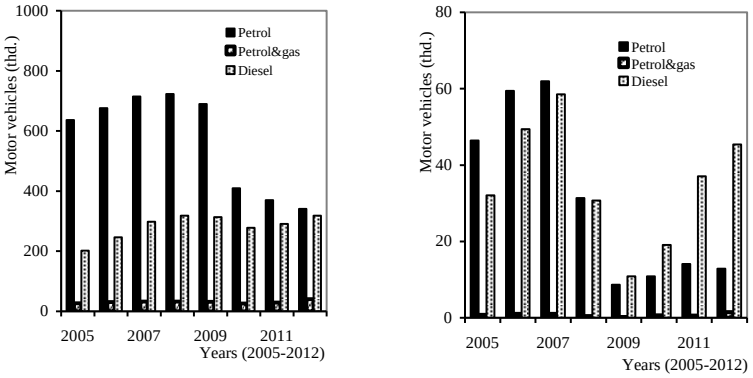
5. MOTOR FLEET

To forecast possible changes in the fuel consumption and prospects for the additional fuel types mentioned in nREAP, it would be useful to take a look at the situation in the transport sector of Latvia. As of 01.07.2013 this sector comprised

only 709 341 registered transport units running on traditional fuels: petrol, diesel or LPG. During the last year increase was observed in the number of vehicles with compressed natural gas systems; still, this number is insignificant. The same situation is with electricity-driven vehicles. The owners of vehicles with so unusual fuel systems are mainly private persons as well as companies working in the energy sector which use such cars in order to popularize their business area.

During the last years the total number of motor vehicles with usual fuel systems has changed. While eight years ago the total number of petrol-powered vehicles was ~ 73.5% and of the diesel-powered vehicles ~ 23.4%, as of 01.07.2013 the share of petrol cars decreased by 28%, the share of gas (LPG) cars increased by 3.3%, and the share of diesel cars increased by 24.7% (Fig. 4*a*) [10]. It should be noted that rapid reduction in the total number of registered vehicles in 2010 was connected with modifications in the rules of transport registration which allowed exclusion from the national register of vehicles registered abroad and of vehicles which had not passed the roadworthiness test for five years.

The situation with motor vehicles registered for the first time confirms the rapidly growing interest in the diesel-powered vehicles (Fig. 4*b*). Since the price of diesel fuel during the last years was almost the same as that of petrol while the diesel powered engine is more economical, many drivers give preference to these vehicles. Such tendency could be observed during the next few years, and, as a consequence of increase in the number of newly registered diesel vehicles, serious changes in the total composition of registered vehicles in Latvia could be expected. In the next years the number of electromobiles might increase, but not to a great extent due to the absence of necessary infrastructure.



a b

Fig. 4. Motor vehicles registered in Latvia (2005-2012)
a - total number of motor vehicles registered;
b - total number of motor vehicles registered for the first time.

It should be noted that a large proportion of the vehicles registered in Latvia are quite old (~12.5 years on average for cars). Due to the economical situation in Latvia more demanded are cars aged 8-12 years. Absence of vehicles specially adapted for use of biofuels can be one of the main obstacles for the biofuel promotion process.

More feasible could be only further adaptation of existing vehicles for use of different biofuel types. As the increase in the diesel fuel consumption and diesel-powered engines is observed, more feasible could be implementation of biodiesel blends with higher content of biodiesel or also of pure vegetable oil (mainly rapeseed oil). One of the options could also be biogas used in dual-fuel systems.

6. POTENTIAL OF LOCAL FUEL PRODUCTION

Based on Renewable Energy Directive it is expected that demand for biofuels in EU will increase in the 2010-2020 period, with the main share contributing to conventional biofuels [5]. The prognosis shows that ~ 41.5% could be obtained from non-EU sources; this percentage can also be higher if precise figures of import are known which would be applicable not only to biofuel but also to the feedstock import [5].

Potential of Latvia for meeting the targets prescribed by nREAP using own resources also is realizable – and in the nearest years. Local production of rapeseed and grain (which are the main sources for biofuel production in Latvia) is currently on a high level and with long traditions [11]. In general, the climate and soil in our country are suitable for rapeseed cultivation. During the last years the sown areas of rapeseed are increasing. For example, in 2010 the increase was 9.7%, and in 2011 – 11.2% (see Fig. 5).

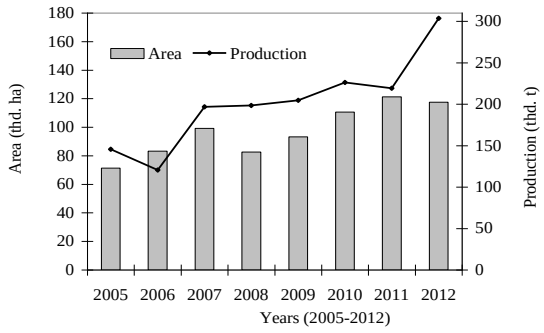


Fig. 5. Sown areas and production of rapeseed (2005-2012), [12].

The increase in sown areas before these years was more rapid than now due to development of the biofuel production sector and the growing demand for raw material. Some decrease in the rapeseed production was observed in the years with unfavourable weather conditions.

It should be noted that the biofuel production sector of Latvia also was created with quite a large production capacity of biodiesel (173 thd. t/a) and ethanol (25 thd. t/a). At this time, it is complicated for biofuel producers to manage their businesses without financial support; in the framework of Directive 2009/28/EC this factor became more actual, since the biofuel has to comply with the sustainability criteria. Biofuels that do not meet these criteria will not be excluded from use but will not receive financial support; they will also not be accounted for when setting the renewable energy targets [5]. Fulfilment of sustainability criteria could be approved in different ways, but it is expected that

the main part of biofuels will be certified though voluntary schemes [13]. Currently, only two biofuel producers in Latvia have certified their products under ISCC (International Sustainability and Carbon Certification) voluntary scheme [4].

At this time the total area of rapeseed land in Latvia is almost 120 thd. ha, and in the future an increase in the sown areas can be expected if all arable land will be recultivated and included into turnover. How it will be realized and how much this area will comply with environment-sensitive land is to be shown by statistics in the future. According to the statistical information, in 2011 only 14.09 thd. ha of rapeseed sown areas in Latvia complied with the sustainability criteria [4]. The same situation was also with corn – 13.88 thd. ha.

Apart from that, more attention from Government is planned to give also to production of the 2nd generation biofuels; however, introduction of this generation diesel products could be expected only after 2015, with increase in the production scale and decrease in the relative costs of technology [14]. The introduction might be realized even later, since the development of 2nd generation biofuel technologies is not progressing as fast as was expected [15] and in the best case these technologies in Latvia might be implemented only by the end of the 2010-2020 period. Therefore, more feasible could be import of products from other countries especially now, when European Parliament on draft legislation has fixed a 6% limit on the 1st generation biofuels towards the 2020 goal of 10%.

7. MAIN BARRIERS

As known, the dominant technology for transport is based on oil [1] and, as the standard, this technology is difficult to replace by competing ones [16] (e.g. by biofuel technology). The main priority is that this new technology is to be strongly incorporated in the dominant technology [17], which means that biofuels could be implemented quite easily; however, in reality it is an involved task. Some influential factors of this implementation are as follows.

Appropriate vehicles. This is one of the factors that affect the use of high-level blends of biofuels. While low-level blends as utilized now do not require a special infrastructure and such fuel could be used in conventional vehicles, the high-level biofuel blends require that there be specially adapted vehicles. Costs of adaptation for existing vehicles to the use of high-level biofuel blends, for example biodiesel, are not too high; however, these will be acceptable at a very small difference between the biofuel and conventional fuel prices. Sometimes even a higher price of fuel cannot affect the choice of consumers; e.g. in Germany the consumers choose lower biofuel blends even at higher costs out of concern for their engines [15]. This means that a new barrier – the information gap – is to be highlighted.

Information gap. EU policy documents highlight the need to supply citizens with better information [18]. The main actions to overcome this barrier should be connected with better targeted education/awareness campaigns [19], which could give clearer picture of the vehicle adaptation and maintenance costs, as also advantages and disadvantages of different technologies or fuels. In the case of Latvia, a special institution is required that would cooperate with public, biofuel producers, oil companies, researchers and potential users of the fuel. Governmental

support – in the form of direct or indirect actions involving demonstration projects and debates/discussions – is here very important. Testing and improvement of conventional biofuel technologies could also be realized as part of demonstration. Apart from that, recommendations of car manufacturers are important for the promotion of the use of high-level blends with biofuels. If some blends are not recommended, the consumer will not use this fuel, even in an old car.

Support for biofuel users. Nowadays, no additional measures are provided that would help to raise interest in biofuels (for example, when choosing a new car): this could be tax reliefs at biofuel vehicle registration, parking incentives, etc. Some support measures are under discussion in Government. Support of the adaptation expenses for the vehicles which would use high-level biofuel blends is also being evaluated by the Ministry of Economics as a possible tool for promotion of biofuel usage in the future.

"Political will" is also an important factor in promotion of biofuel usage, especially in the municipal companies as has been realized in many EU countries for several years. Implementation of pure biofuels or higher blends with fossil fuels in the transport sector of Latvia has not been realized at all, even in the companies owned by local municipalities. Currently, adaptation of vehicles for the use of rapeseed oil as fuel for diesel engines is realized by companies whose business is connected with the production of rapeseed oil.

8. CONCLUSIONS

Situation in biofuel sector in Latvia has been changed during the last years – production and use of biofuels increased as compared with those in 2001 when the biofuel production was initiated. Despite that, the biofuel consumption envisaged by the action plan has not been achieved – and is far from that. The main tools used for promotion of the usage of fuels in the transport sector are the measures which are applied in many EU countries: excise tax incentives and mandatory biofuel blending, with the last one being the most effective tool for increasing the consumption of biofuels.

Government of Latvia is in search for new tools to stimulate the usage of biofuels; however, in the nearest time the main result of this search will probably be extension of the excise tax application terms and increase in the mandatory admixture of biodiesel to fossil diesel to 7%.

The existing energy and transport system of Latvia is on the way to change, and it seems that more attention can be turned to fuels which could be used in diesel-powered engines. Indeed, the biodiesel production infrastructure has already been created and its capacity is sufficient to supply the internal market with biodiesel; for this purpose some incentives have to be realized by the time when use of the 2^{nd} generation biofuels becomes economically reasonable and implementation of the new technologies is more feasible. Besides, the tendency in EU in the nearest 5 years is now toward the use of biodiesel; for example, in 2010 biodiesel presented 77.25% of the total biofuel consumption in transport and bioethanol – 21.10% [1]. It is also expected that by 2020 these two biofuels (mainly biodiesel) will account for 90% of the total renewable energy consumption in the EU transport sector.

As known, the total amount of produced biodiesel in Europe decreases [20]. Nevertheless, this biofuel will probably play a major role in the next years not only in Europe, but also in Latvia, under the condition that appropriate policies are pursued and the necessary supporting measures are taken; also, special information actions at the national level are needed.

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BIODEGVIELAS TRANSPORTA SEKTORĀ LATVIJĀ: PIEREDZE, PATREIZĒJĀ SITUĀCIJA UN BARJERAS

R. Smigins, P. Shipkovs

K o p s a v i l k u m s

Pēdējo 10 gadu laikā biodegvielu ražošana un izmantošana ES ir kļuvusi daudz plašāka, pateicoties spēcīgam Direktīvu atbalstam. Galveno Direktīvu definēto mērķu sasniegšana nebija viegla un saskārās ar dažādiem sarežģījumiem. Latvija ir viena no ES valstīm, kas uzstādīja ambiciozu mērķi biodegvielu ražošanā un tālākā šīs degvielas izmantošanā transportā. Dotais raksts dod ieskatu galvenajos valsts sasniegumos šajā sfērā, kā arī analizē galvenās barjeras, kas traucē biodegvielu ieviešanu transporta sektorā. Tāpat tiek dots ieskats uz valsts esošo situāciju enerģētikā un transportā.

09.11.2013.