Opinion of the European Economic and Social Committee on The development and promotion of alternative fuels for road transport in the European Union

(2006/C 195/20)

On 14 July 2005, the European Economic and Social Committee, acting under Rule 29(2) of its Rules of Procedure, decided to draw up an opinion on: *The development and promotion of alternative fuels for road transport in the European Union*

The Section for Transport, Energy, Infrastructure and Information Society, which was responsible for preparing the Committee's work on the subject, adopted its opinion on 24 March 2006. The rapporteur was Mr Ranocchiari.

At its 427th plenary session of 17 and 18 May 2006 (meeting of 17 May) the European Economic and Social Committee adopted the following opinion by 82 votes to 2, with 1 abstention:

1. Executive summary and recommendations

1.1 Energy demand is expected to grow dramatically in the next decades and public concerns are mounting over energy dependence from outside regions and environmental issue.

1.2 The EESC is fully aware of the problem and it has been adopting important exploratory or own initiative opinion on key energy issues ([1]), while some others are still under discussion ([2]).

1.3 All the EESC opinions concur on some fundamental assumptions. The dominance of traditional (fossil) energy sources will continue for the next two or three decades. At the same time the contribution from renewable energies will definitely grow but not at a rate above that of energy consumption. Their share in the energy supply will stay 15 % to 20 % of energy consumption. Nevertheless renewable energy sources have a preferential role to play and must be promoted and supported.

1.4 The same occurs for the road transport sector which is practically fully depending on oil (gasoline and conventional diesel). The present opinion therefore intends to make a contribution to the European Commission challenging objective of a 20 % substitution of traditional fuels by alternative ones before the year 2020.

1.5 The Commission plan entrusts biofuels, Natural Gas (NG) and Hydrogen (H_2) with the task of displacing petroleum-derived fuels. As a matter of fact because of its fossil origin NG should not be considered as a full alternative fuel as it is not a renewable source, nevertheless its contribution to the Commission objective is of paramount importance, because of its large availability and environmental benefits. None of the two first options (biofuel and NG) is perfect, entirely free of adverse effects on the environment, and on energy efficiency. Hydrogen seems to be the correct answer but much more R&D is required to come up with a safe and cost-effective 'Hydrogen Economy'.

1.6 Biofuels bring about environmental benefits because as a rule they have a much lower impact on the climate and ideally have no impact at all. Since crop-based fuels such as bioethanol and FAME (Fatty Acid Methyl Ester) are available in quantities which are commensurate with the crop itself, blending of bioethanol into the gasoline pool and of FAME in the diesel pool is an effective and environmentally sound strategy.

1.7 Blending components must comply with the specifications issued e.g. by CEN (Comité Européen de Normalisation) in order to preserve the proper functioning of the engine and to prevent that fuel consumption and exhaust emission deteriorate. Higher concentration of FAME in diesel fuel requires specific vehicle adaptation. This is a possibility in case of dedicated fleet e.g. city buses.

1.8 The Commission issued the Directive 2003/30/EC to promote the use of biofuels while regarding NG no specific initiatives were taken to date, but the possibility of tax reduction is the same as for the biofuels: yet it expects from NG the largest single contribution to the 2020 objectives. Apparently the European Commission wanted to see how things were going to develop for NG as the result of the tax advantage.

1.9 Five years after the Commission communication and three years after the Directive on alternative fuels, progresses are below expectations because Member States are not on track to meet the scheduled targets. This is possibly one of the reasons that the European Commission recently issued a Communication on 'Biomass action Plan' ([3]).

([1]) Promoting renewable energy: Means of actions and financing instruments (OJ C 108, 30.4.04); Nuclear fusion (OJ C 302, 7.12.04); Prospects for traditional energy sources (OJ C 28, 3.2.06); Renewable energy sources (OJ C 65, 17.3.2006); Energy efficiency (OJ C 110, 9.5.2006).

([2]) Energy supply of the EU: strategy for an optimal energy mix (CESE TEN/227).

([3]) COM(2005) 628 final on 7 December 2005.

1.9.1 The plan refers to biomass use in transport, electricity and heating. Main action proposed on the transport sector are: i) new EU legislation on the use of renewable energies; ii) a possible revision of biofuels directive, during 2006, which may set national targets for the share of biofuels and would compel fuel suppliers to use biofuels; iii) Member States national biomass action plans; iv) research into second generation biofuels (from wood and waste).

1.9.2 According to the Commission expectations the plan should reduce oil imports by 8 %, prevent greenhouse gas emissions of 209 million tonnes CO_2-equivalent with a direct cost of EUR 9 billion per year. Six billions out of nine will be devoted to transport biofuels, which are much more expensive than petroleum derived fuels (e.g. to be competitive biodiesel needs an oil price of about $95/barrel while bioethanol needs a price of about $115/barrel ([4])).

1.9.3 The EESC warmly welcomes the Action Plan because it is in line with the present opinion aiming to spur the other European Institutions and Member States into giving more impulse to appropriate measures for the promotion of alternative fuels.

1.9.4 The EESC also welcomes the latest communication of the Commission on 'An EU strategy for biofuels' ([5]) urging new drive to boost biofuels production.

1.10 As a matter of fact, whilst biofuels and NG can expand on the market thanks to engine technology and fuel distribution system, and this expansion makes it possible to displace petroleum-derived fuels to the envisaged extent, long term alternatives such as hydrogen are the object of development efforts: in other words, biofuels and NG are a bridge to the sustainable fuel mix of the 2020 and beyond.

1.11 The EESC recommends that binding measures are adopted by the European Commission in case the revision of Biofuel directive foreseen in 2006 shows that Member States action was not sufficient to attain the expected targets both for biofuels and for NG.

1.12 The EESC recognises that greater use of NG as an automotive fuel is a sensible alternative to petroleum until such a time as hydrogen technology is applicable. The European Commission and the Member States should therefore make repeated references in their communication strategies to this technology — which is already economically viable now — and also set a good example when they acquire vehicles themselves.

([4]) Footnote No 16 of 'Biomass action Plan' COM(2005) 628 of 7 December 2005.
([5]) COM(2006) 34 final of 7 February 2006.

2. **Reasons**

2.1 In November 2001 the European Commission issued a communication concerning alternative fuels for road transport ([6]) which followed up on the Green Paper *Towards a European Strategy for the Security of Energy Supply* ([7]) and on the White Paper *European Transport Policy for 2010* ([8]). The November 2001 communication contained an action plan in two points.

2.2 The first point aimed at expanding the use of biofuels following a twofold approach. On the one hand it envisaged to put on the market an ever increasing quantity of biofuel blended gasoline and diesel in order to pave the way to a mandated biofuels blending. On the other hand it proposed tax incentives in order to make biofuels financially attractive, also including NG in this proposal. The EECS expressed its opinion on this first point on 25 April 2002 ([9]). Eventually both proposals were adopted ([10]).

2.3 The second point called for an *Alternative Fuels Contact Group* whose charter was to give the Commission advices on market development of alternative fuels at large, and of Natural Gas (NG) and hydrogen (H_2) in particular. The Contact Group's study was to cover the next 20 years in line with the Commission's objective that is to grow the alternative fuels market to the extent that by 2020 they can substitute for one fifth (20 %) of the petroleum derived fuels.

2.4 In December 2003 the Contact Group issued a thorough and factual report ([11]).

3. **The 2020 scenario and how to get there**

3.1 In the Commission's plan biofuels, NG, and H_2 are the three alternative fuels which are expected to play the major role in meeting the 20 % substitution objective as follows:

Year	Biofuels	Natural gas	Hydrogen	Total
2005	2			2
2010	6	2		8
2015	7	5	2	14
2020	8	10	5	23

([6]) COM(2001) 547.
([7]) COM(2000) 769.
([8]) COM(2001) 370.
([9]) OJ C 149, 21.6.2002.
([10]) Directives 2003/30/EC (OJ L 123/42 of 8 May 2003) and 2003/96/EC (OJ L 283/51 of 27 October 2003).
([11]) Report of the Alternative Fuels Contact Group, Market Development of alternative fuels, December 2003.

3.1.1 Biofuels are to contribute by 2 % since 2005 and then they are to continue growing up to 8 % by 2020. Any fuel derived from biomass is known generically as a biofuel. The main candidates for transport are currently:

3.1.1.1 **Bioethanol,** that is ethanol (EtOH) also known as ethyl alcohol, made from starchy materials like cereals and sugar beet by fermentation. It is used either neat as gasoline substitute, e.g. Brazil, but then it requires dedicated engines; or it is added to the gasoline pool either neat or under the form of the synthetic chemical ETBE (Ethyl-Tertiary-Butyl-Ether). According to the specifications which define the gasoline grade, ethanol can be mixed with gasoline up to 5 % without any engine modification.

3.1.1.2 **Biodiesel**, a diesel alternative made from a range of vegetable oils by transesterification and known as FAME (Fatty Acid Methyl Ester). The most widely used biodiesel in Europe is rape-seed methyl ester (RME). The CEN (Comité Européen de Normalization) defined a FAME standard and product meeting the CEN specifications is accepted up to 5 % in diesel vehicles already. Production of FAME from crop-based sources such as rape-seed has until recently been sufficient to meet demand, taking advantage of specific fiscal incentives. In the November 2001 communication the Commission expressed concerns with respect to large-scale production of crop-based fuels and its feasibility ([12]).

3.1.1.3 **Biogas**, i.e. methane rich gas produced from organic matter including manure, waste-water sludge, or municipal solid waste by anaerobic fermentation, is akin to NG. Biogas has to be upgraded to NG quality in order to be used in normal vehicles designed to use NG. There are more than 5 000 vehicles in Sweden running on biogas. The Swedish experience shows that methane, either biogas or NG, is an economical sustainable fuel with the potential to drastically reduce emissions in urban transport.

3.2 With respect to **Natural Gas** the European Commission was not so active as the NG contribution to the 2020 target would have requested and no specific proposal was presented to date.

3.3 The lack of Commission's initiative is troublesome insofar as the Report issued by the Commission appointed Alternative Fuels Contact Group, based on a thorough *Well-to-Wheels Analysis* (WTW)of alternative fuels, came to the conclusion that: 'natural gas is the only alternative fuel with potential for significant market share well above 5 % by 2020 which could potentially compete with conventional fuels in terms of the economic of supply in a mature market scenario'.

([12]) COM(2001) 547: Heading *Agriculture policy* under paragraph 2.2.

3.4 In the November 2001 communication the Commission entrusted NG with the largest single contribution to the alternative fuels 2020 objective. The Contact Group concurred for the following reasons:

3.4.1 NG meets the need for improved security of supply not only through fuel diversification, because it is not oil-dependent, but also because the demand is not limited by primary supply. Whereas the expansion of biofuel could become supply-limited eventually, a share of 10 % in road transport, i.e. the Commission's objective for 2020, would represent about 5 % of the EU total NG consumption expected at that time. This remark emphasises the need of a synergistic development for all three alternative fuels.

3.4.2 NG helps to achieve the strategic objective of reducing GHG emission. It is obvious from the chemical structure of methane (CH4) that NG contains less carbon than other fossil fuels, e.g. gasoline and diesel. The WTW analysis demonstrated that GHG emission from a Compressed Natural Gas Vehicle (CNGV) are below those of a gasoline fuelled vehicle and, with today's technology, comparable to those of a diesel vehicle. It is expected that as a result of progresses in CNGV engines technology, GHG emission will be better than diesel in 2010 and in the years after.

3.4.3 Besides GHG emission, NG as a motor vehicle fuel brings about additional environmental benefit in terms of exhaust emissions. NG vehicles in use today have very low emissions of Nitrogen Oxides (NOx) and do not contribute to produce Particulate Matters (PM) which are a critical issue. Stringent European Union limits on airborne particles are accordingly a good thing for NG fuelled vehicles. NG fuelled city buses have proved to be a viable form of urban transportation and the European Commission has helped to boost the introduction of model vehicles by providing financial support. The urban environment could easily be improved by enforcing the use of NG in bus fleets ad garbage collection trucks, as part of a sound 'green procurement plan'.

3.4.4 One important step in this direction could be done with the recently proposed directive on the promotion of clean transport vehicles ([13]). Once approved, this directive will compel Member States to reserve each year a 25 % quota of the heavy duty vehicles (above 3.5 t) purchased or leased by public bodies, to vehicles fuelled with alternative fuels meeting the EEV standards ([14]) The EEV (Enhanced Environmentally friendly vehicles) standards apply to vehicles fuelled with biofuels, CNG, LPG, hydrogen as well as to hybrid and electric vehicles.

([13]) COM(2005) 634 final of 21 December 2005.
([14]) See directive 2005/55/EC.

3.5 **Hydrogen** does not exist in nature in free form. What exist in nature are chemical compounds which comprise hydrogen, e.g. water and hydrocarbons. Water (H_2O) is made up with 11 % H_2 by weight (2/18). Gasoline and diesel fuel are a mixture of hydrocarbons. Methane, a hydrocarbon, is the main constituent of NG and of biogas.

Since H_2 does not exist in nature, it must be made. Indeed it is commercially produced for use in the chemical, petrochemical, petroleum refining and other industries.

In order to produce hydrogen, e.g. from water by electrolysis or from NG by steam-reforming, energy needs to be applied, namely electricity in electrolysis and heat in steam-reforming.

WTT (Well To Tank) analysis is instrumental in ranking the pathways from feedstock to H_2 according to energy consumption and GHG emission.

For a long time H_2 is an industrial commodity which is produced and marketed by the industrial gases' companies or is produced for captive use in oil refineries. However its use as transport fuel is in its infancy. For this reason the objective of a 2 % substitution in 2015 with further growth to 5 % by 2020, is quite challenging.

3.5.1 The Contact Group identified several issues with respect to an expanded use of H_2 as transport fuel, such as:

i) liquid H_2, i.e. at 252°C below freezing, in cryogenic tanks, e.g. aboard an Internal Combustion Engine (ICE) vehicle, or gaseous H_2 e.g. compressed in bottles at 700 atmospheres aboard a fuel-cell vehicle;

ii) centralised H_2 production in large capacity units which can be optimised with respect to energy consumption, or distributed production in small units at the filling station;

iii) as fuel-cell vehicles show their best efficiency in the mid-power range, perhaps it would be advisable to distinguish between fuel-cell vehicles for operation, at reduced power, e.g. urban traffic, and ICEs for long haul, i.e. long intervals in which the engine has to deliver full power;

iv) other points of concern pertain to the technology of the fuel cell itself, i.e. the device in which H_2 releases the electrons flow that is the electrical current which drives the electrical motor which in turn causes the revolution of the wheels. These subjects are beyond the scope of this opinion.

3.5.2 In summary alternative fuel H_2 offers a twofold challenge: i) the fuel distribution; and ii) the power train. It makes sense that an ever-increasing amount of R&D money has been invested by the EU in hydrogen and fuel cells by way of FP5 and FP6. Currently, under the FP6, hydrogen and fuel cells research is placed within the sustainable energy system sub-priority, with a total budget of EUR 890 million. The European Parliament during the current discussions on the next FP7 is proposing to reposition the issue in a new key thematic priority on 'all existing and future non CO_2 emitting energy sources' with even larger resources. The environmental benefits resulting from the fact that water and water only is produced during the oxidation of H_2 in a fuel cell, justify the effort.

4. **Conclusions**

4.1 The European Commission's November 2001 objective, namely 20 % alternative fuels by 2020, rests on two established technologies/products: biofuels and NG, and on one promising development, i.e. H_2 and fuel cells.

4.2 Biofuels and NG — notwithstanding some hurdles — are available here and now and have the qualities to take on the challenge both with respect to fuel distribution know-how and with respect to engine technology.

4.2.1 Because of its fossil origin, i.e. it is not 'renewable', NG should not be considered as a full alternative fuel; nevertheless today it represents one of the most realistic options to replace fuels derived from crude oil, indispensable to meet the 20 % substitution in 2020. The reasons why NG may play a major role as alternative fuels are:

— reserves of NG are ample and will last more than crude oil;

— In spite of recent troubles geo-political distribution ensures a relatively stable market by comparison with oil;

— it has the highest H/C ratio in hydrocarbons with the lowest CO_2 emission;

— NG can be a pathway to Hydrogen.

A strong NG grid will act eventually as facilitator to local small scale Hydrogen facilities. The present barriers to the diffusion of NG vehicles are mostly due to the insufficient and not uniform distribution network.

4.2.2 Regarding biofuels they combine the positive environmental performance of NG with the benefit of being a renewable energy source, reducing the dependency from the fossil fuels. Moreover, even if it is not clearly proven, a real chance exists to increase or at least not to lose further jobs in the agricultural sector. Forestry resources can contribute to biofuels production, e.g. by way of black liquor gasification and by fermentation of ligno-cellulosic biomass. Both technologies are now at the pilot plant stage and their contribution to biofuels production will make itself felt in the medium-term future. However, having in mind the current demand of fuel for transport needs ([15]), a huge increase of biofuels use must be evaluated in the light of collateral environment effect:

— Crops for biodiesel represent a niche production, unable to cover the EU demand of fuel.

— In order to meet the 2010 target of 6 % share, up to 13 % of the total agricultural area in the EU 25 will need to be devoted to biofuel crops. This could lead to onerous measures in order to protect lands, groundwater and biodiversity, as well as to prevent further greenhouse gases emissions ([16]). Imports would only move the problem to other countries, increasing maritime traffic.

4.2.3 It appears as if the Commission Communication issued on 7 February 2006 intends to tackle these problems and uncertainties ([17]). Several measures to promote and support the production and use of biofuels both in EU and non EU countries have been pulled together. The EESC will follow with great interest the implementation of the announced strategy.

4.3 Meeting the 2020 alternative fuels objective requires a synergistic approach, namely all three fuels have to receive attention simultaneously.

4.4 It is a reasonable expectation that the effort related to the market development of those alternative fuels which are commercially proven is going to meet fewer hurdles because both know-how and technology are available here and now.

4.5 The European Commission should get together with industry to consider why the measures adopted until now are not sufficient for the diffusion of NG as an automotive fuel. In our opinion a minimum target should be established by each Member State, taking into account the specific national situation.

4.6 This proposal should also review the technical and safety requirements for CNG filling stations. In many cases this requirements are quite old and do not take into account recent developments. Such a revision may definitely help a wider diffusion of CNG filling stations, together with the simplification of bureaucratic procedures. Very often the authorisations for building a CNG filling station are unnecessary complex and time consuming.

4.7 As already mentioned in point 4.2.1 above, such a programme will also facilitate the transition to Hydrogen Vehicles tomorrow. As a matter of fact, technology advances with respect to on board fuel storage will be instrumental for compressed Hydrogen too. The same is true for Hydrogen fuelling, metering and station design. Any investment in NG technology is a step forward for Hydrogen too.

4.8 The prompt development of the commercially proven alternative fuels can provide a fallback position in the event that an unforeseen delay hits the ambitious H_2 development schedule.

4.9 Last but not least, EESC reiterates once again that a real progress towards greener cars with lower fuel consumption is not only linked to the development of alternative fuels but can also be obtained by fighting congestion with better infrastructures, promoting collective transport, and, even more important, changing consumer's behaviour. The present SUVs (*Sport Utility Vehicles*) fad shows the consumers are not ready to change. Most of these vehicles use up large amounts of fuel and CO_2 emissions are commensurate to fuel consumption. The raising demand for such cars makes it difficult for car makers to commit towards greener cars.

Brussels, 17 May 2006.

The President

of the European Economic and Social Committee

Anne-Marie SIGMUND

([15]) Biofuels currently represent around 0.6 % only of diesel and gasoline consumption in EU.

([16]) European Environment Agency (EEA 2004/04). Further studies are trying to assess how much biomass can Europe use without harming the environment.

([17]) 'An EU strategy for biofuels' COM(2006) 34 final.