Consultation on Review of EU biofuels directive

The BEST-project (Bioethanol for Sustainable Transport), an EU project within FP6 programme, has discussed the questions posed by the Commission. Our answers are based on the experience made by BEST partners and colleagues. Please find our response below.

BEST regards

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Q1.1 Is the objective of promoting biofuels still valid?

YES

Q 2.1 With existing measures, will biofuels reach a market share of 5.75% (in energy terms) in the end of 2010?

The experiences from BEST is very clear In spite of very designated partners, willing to put hard and strenuous effort in promoting biofuels for transport, it is hard to initiate such a development.

High blends
Typical obstacles, delaying and/or blocking the development of high blends as E85 (85 $\%_{vol}$ ethanol and 15 $\%_{vol}$ petrol) and E95 are

1) Lack of standards and harmonisation for fuels and fuel handling
   - The bus fuel E95 consists of 95 % ethanol and an ignition improver, a corrosion inhibitor and denaturants. To make sure that the ethanol content is not drinkable, the authorities in **each** member state needs to test if this blend could be regarded as denaturated. This process should of course be harmonised between MS so it only has to be assessed once.
2) Obsolete quality, safety and tax legislation
   - Italian authorities claim that legislation does not allow ethanol to be stored at the same fuelling station as petrol thus blocking the introduction of E85. It is however possible to store drinking ethanol at the same fuelling station
   - National fuel taxes are based per litre – thus giving benefit to energy-rich fossil fuels as diesel and petrol, disfavouring e.g. E85 which contains less energy/l than petrol. E.g. the Netherlands and Italy tax the Ethanol content in E85 similar to petrol on litre basis, with the result that the biofuel E85 is actually 30 % **higher** taxed than petrol per energy content.
   - As there are no emission standards for ethanol vehicles they are tested when operating on petrol, hence giving no incentives for car manufacturers to optimise the engine for ethanol operation, thus making them unnecessarily energy-demanding. An ethanol

emission standard should also consider that much of the hydrocarbon emitted is harmless ethanol.

3) Lack of (ways for) introductory supporting measures, including a definition of clean vehicles.
   Experience from countries that have started a biofuel vehicle development (Sweden, Brazil, US, Switzerland) is that at least during an introductory phase, rather strong incentives are needed to balance the risks and uncertainties for the buyers regarding durability, long term fuel supply, second hand value of the vehicle etc. A handful member states have implemented such measures but most have not even started.

Low blends
The Fuel Quality Directive (Directive 98/70 as amended by directive 2003/17) prohibits blending more than 5 % ethanol in petrol. Long term experiences from Brazil and USA and a shorter testing period in Sweden shows that most modern vehicles can operate on this blend.

A recent study on emissions (Swedish Road Administration, 2006) shows that 3 out of 4 conventional vehicles meets the emission standards also when driving on such high blends as E43 (43 % ethanol in petrol). The vehicle tested on E17 also met the emission standards. Also the car manufacturers (ACEA) approves in principle E10.

Q2.2 The main factors favouring the use of biofuels?

- An increasing interest for biofuels, triggered by raising oil price, vulnerability in delivery, the recent success in Sweden and the announced launch of ethanol vehicles from several auto-makers
- The fact that the technology is simple, mature and proven reliable
- An increasing awareness of climate change

The main obstacles?
- Slow introduction of regulations for handling, storing and dispensing ethanol/bio fuels
- focus on low blends instead of high blends (slow shift of technology)
- the cost for biofuels

Q3.1 Looking towards 2010, is the present European system of indicative targets and support for biofuels appropriate or does it need to be changed?

- It is appropriate. It is at a level that is possible to achieve, shown e.g. by the Swedish example and is within the supply potential given by several studies.

Q3.2 What are your views on the advantages and disadvantages of the options described in section 3.2 of this paper?

A. Amendment with fixed target for each member state (MS), mandatory.
B. Fix targets retained, once fixed by MS, mandatory
C. Fix targets retained, targets can differ but only under certain circumstances.
D. Directive amended, MS must use biofuel obligation as a tool
E. Biofuel obligation EU level on fuel suppliers

F. Amendment to permit MS to impose biofuel obligation
G. Fuel quality directive amended with low blend obligation
H. Voluntary agreement with oil and vehicle industry
I. Fuel labelled with contains of biofuels
J. Campaign for biofuels

BEST partners are positive that mandatory targets would be beneficial, but stress that:

- higher blends must also be targeted. By using low-blends only, it is not possible to achieve the long-term objectives of 20 % substitution. As the development of vehicle models takes time, it is necessary to target high-blends now, in order to give clear signals for the vehicle and infrastructure development.
- targets must be at a level that is possible and practical to achieve, given the global supply potential and the possibilities to develop infrastructure.

Q3.3 How should the option (s) you favour be put in practice?
Q3.4 Should other options be put in practice?
Q3.5 Would you change your mind if your choices meant that tax reductions had to be prohibited?

Q3.6 Should a MS be able to provide tax reductions and biofuel obligations at the same time (or the one or the other)?

According to BEST partners' experience tax reductions are necessary (at least during a transition period) in order to promote high blends. We cannot see how a biofuel obligation alone would change this. A biofuel obligation would mainly target low blends, as the recent obligations in Germany, Italy and the Netherlands. The Swedish obligation for fuel stations to provide at least one biofuel would not be sufficient if it was the only measure.

Q4.1 Should there be a certification system to ensure that the cultivation of biofuels is made in the most environmentally efficient way?

Q4.2 Introduction of a wider system of certification be introduced, indicating the GHG and/or security of supply impact of each fuel?

Biofuel production must be sustainable and certification systems have shown to be a good way of promoting environmentally friendly ways of production in other fields. One of BEST's task is to develop / improve such a certification system of bioethanol, also including the issues of GHG, fair trade and security of supply. Intermediary options that can act as stepping stones between full assurance and certification and the current lack of environmental monitoring will also be explored, such as 'carbon and environmental declaration'. Options for environmental labelling of vehicles that reflects the benefits arising from biofuels will also be evaluated.

Q4.3 Should there be a scheme to reward second-generation biofuels?

Beyond 2010

Q5.1 Should the EU continue acting in favour of biofuels after 2010.

BEST's concept is to start the development of a market breakthrough, with the ultimate long-term objective of substituting as much as possible of fossil fuel with biofuels. (Also conservative calculations estimate that more than 30 % of the energy for transport could be substituted by biofuels by 2050). This development will probably not take place before 2010 and there will be a further need for action after this date.

Q5.2 Should the action include of exclude the definition of quantifiable target for biofuels?

Q5.3 Should EU action include the following measures (which could be pursued without defining a quantifiable target)

a. support for research, development and dissemination of good practice?

Through EC-support it has been possible for BEST to disseminate experiences already made before the project. During the first six months of the project more than 15 additional ethanol fuelling stations have been opened **outside** BEST – influenced by BEST partner's activities

b. Continued Community financial support for the supply of biofuels and their feedstock?

c. Continued scope for Member States to support biofuels through tax reductions/exemptions?

Yes, see Question 2.1 and 3.6

d. The labelling of all fuel to show the proportion of biofuel it contains?

e. A campaign to inform consumers of the benefits of biofuels?

Campaigning is one of BEST's core activities and has shown to be very efficient in e.g. Sweden and Brazil – once the driving force of beneficial consumer economics is in place.

f. Any other option?

The most important additional action is to develop a common definition of 'Clean Vehicles'. This will take time as there are many interests and many possible principles to use, all of them with certain disadvantages, hence it is necessary to start the process immediately.

Several technical standards need to be set or harmonised. Today national authorities have no guidance at all and have to start from scratch in each country - going through all the doubts and resistance etc - which delays or even blocks the introduction of biofuels e.g.:

- Fuel standards for E85, E95, (possibly E10 - if the Commission decides to go for E10 - many MS rely on this to fulfil the Biofuels Directive), possibly also E-diesel (10 % ethanol derivate in diesel)
- Fuel standard for biogas (there is one in official and one for natural gas that could be adapted)
- Safety, security and environmental standards for ethanol fuels

- Emission standards for ethanol vehicles (today all ethanol vehicles are tested when operating on petrol). An ethanol standard could start from the petrol standard, but it would be better if the HC-emission test is adapted to only measure non-ethanol HC (as gas vehicle standards only measure non-methane HC)

Q 5.4 If the EU is to define a quantified target for biofuels after 2010, what should it be and what year should it relate to? 2015 or 2020 or both?

Q5.5 If the EU is to define a quantified target for biofuels after 2010, should this be expressed in the terms of market share (as today), GHG savings, reduced oil consumption, reduced fossil fuel consumption?

Q5.6 If the EU is to define a quantified target for biofuels after 2010, should this remain a purely political step (accompanied by monitoring) or should it be given concrete form? This is:

a. adding reference values for later years to the biofuels directive as presently drafted?
b. One or more options in section 3.2?
c. Some other form

Question 6.1

Do you have any comments on the following issues, listed in the biofuels directive for inclusion in the Commission's progress report:

a. the cost-effectiveness of measures taken by member states in order to promote the use of biofuels and other renewable fuels:

i. the use of bioethanol as a transport fuel is typically a low cost option for governments, fuel suppliers and consumers to implement where the cost of supplying and using the bioethanol is lower than, or equivalent to, fossil fuels on an energy equivalent basis.
ii. The example of Sweden shows that tax reduction together with other biofuel incentives are a very cheap way of reducing CO_2. The total cost is approximately 0,4 €/kg CO_2-reduction, which is about 50 % lower than average cost of other means of CO_2-reduction (0.9 €/kg CO_2-reduction).
iii. At low blends (less than $5\%_{vol}$) no modifications are required to vehicles or fuelling infrastructure or to existing legislation.
iv. At blends between 5 to 10% only minor modifications may be needed to vehicles 10 years old or older. Limited modifications may also be required to the fuel distribution system.
v. FFVs capable of using E85 ($85\%_{vol}$ EtOH) typically cost c. Euro200 more than the non-flex model with costs reducing as the market share increases.
vi. Over the last two years the cost of ethanol has been equivalent or lower than petrol on a volumetric basis but not sufficiently low on an energy basis to make ethanol directly competitive. At volumetric blend percentages of 5% the resulting increase in per km driven costs is negligible.
vii. Where the volumetric cost of ethanol (Euros per litre) is 35% or more lower than petrol as supplied to the vehicle, the fuel-based vehicle running costs will be equivalent or lower than those of a standard petrol-only fuelled vehicle.

Volumetric price parity between ethanol (blends) and petrol will result in price discrimination against the ethanol-based fuel due to increased costs per km.

b. the economic aspects and the environmental impact of further increasing the share of biofuels and other renewable fuels?

i. Carbon abatement costs and impacts
   - Engagement with the public and policy- the acceptability and impact of biofuels will be measured by the public in terms of the publicly accessible indicators- in particular gCO2 per km driven. Preliminary work for BEST and Ford shows that E85-fuelled Flex Fuel Vehicles can reduce GHG emissions to below 100 gCO2eq per km and where well established, but efficient, ethanol production and delivery systems are used to below 60 gCO2eq per km. This is significantly better than any other alternatively fuelled vehicle technology currently on the market.
   - Measurement of the impact of biofuels at the tailpipe does not allow a real comparison of the effectiveness of biofuels by the public or provide a simple metric for rewarding the low-carbon nature of the biofuels. In addition, low-blends may not have a sufficiently large impact on transport-based GHG emissions to gain public acceptability.

ii. Land use change – outside the remit of the BEST project

iii. Rural development / CAP – economic benefits will arise throughout the production, supply and use chain for biofuels due to increased activity that will result from the use of a novel fuel and vehicles. Macro economic benefits will arise if these novel activities result in technological advantage and / or increase productivity both in agricultural and economic terms.

iv. Water use – needs to be considered at the agricultural production and conversion stages.

v. Carbon leakage / displacement – outside the remit of BEST except to highlight that energy efficient vehicles reduce both GHG emissions and economic impacts. FFVs and Ethanol buses have been shown to be at least as energy efficient as the conventional-fuelled alternatives and have the possibility to be significantly better with future developments in engine performance.

c. the life-cycle perspective of biofuels and other renewable fuels [and] possible measures for the further promotion of those fuels that are climate and environmentally friendly, and have the potential of becoming competitive and cost-efficient?

i. Using an LCA basis, the production, supply and use of bioethanol can range from strongly positive for both GHG emissions and energy balances to worse than the petrol fuel being replaced.

ii. Ensuring beneficial impacts at least-cost requires:
   - Efficient markets and end-uses e.g. reliable and efficient vehicles and delivery mechanisms as being promoted by the BEST project

iii. Efficient production and supply chains- this requires incentives and policies which prohibit bad practices and reward best practices and good integration / logistics.
iv. The provision of a level and transparent policy base with clear long-term signals to the private sector on issues such as low-carbon-based incentives, broader assurance and certification, eco-labelling, etc
v. High blends using FFVs offer a very large degree of flexibility in allowing significantly expanded future targets by:
    - allowing flexible blends to be used over time e.g. higher than target during certain months and lower in other periods
    - securing public acceptability by removing the risk that should no biofuel be available their vehicles will still work
    - maximising the benefits of biofuel fuel properties e.g. oxygen content, latent heat of evaporation, etc. (see answer to 6.3. below)
    - minimising refuelling infrastructure investments

d. the sustainability of crops used for the production of biofuels, particularly land use, degree of intensity of cultivation, crop rotation and use of pesticides?

i. Land use – not directly applicable to BEST
ii. Degree of intensity of cultivation. High input levels can result in poor GHG and energy balances where increased yields are not proportional to the level of inputs. In these cases, excess fertilisers and pesticides will leach into the environment with potentially serious environmental and human health impacts. Systems that reward efficient production and supply chains (see answer to 'c' above) would discourage such poor land use practices.

e. the assessment of the use of biofuels and other renewable fuels with respect to their differentiating effects on climate change and their impact on CO_2 emissions reduction?

i. Low blends of biofuels can make a small but noticeable impact on Transport sector GHG emissions. Larger reductions in Transport-based GHG emissions and oil dependency, will depend on:
    - Higher blend rates of GHG efficient biofuels
    - Increased efficiency of fuel usage
    - Increased shares of low-carbon delivery of mobility services
    - And/or demand-side management
ii. The technical risk of implementing higher biofuel targets in future rounds of the Biofuels Directive is reduced by the promotion of Flex-fuel Vehicles because of the flexibility gained by having a small but significant share of the transport sector physically able to use much higher bioethanol blends
iii. The BEST project will build on the successful history of ethanol fuel usage by demonstrating that Flex-Fuel Vehicles and Ethanol Buses work efficiently with high biofuel blends and result in significant reductions of GHGs (given low GHG-factor WTT bioethanol is used) and regulated pollutants. In doing so, it will help to alleviate technical and social concerns with the use of biofuels.

This engagement with the public / consumers is likely to be a major factor in the overall success of the Biofuels Directive in the medium to long term.

iv. Further work that investigates and develops the potential for coupling biofuel production with carbon sequestration should be given serious consideration.

f. further more long-term options concerning energy efficiency measures in transport?

i. The use of biofuels to fuel hybrid vehicles holds considerable promise in reducing GHG emissions to very low levels (0 to 50 gCO2eq per km)

ii. The development of markets for high blend and pure biofuels will encourage vehicle manufacturers to take advantage of the chemical properties of bioethanol to improve combustion efficiency

iii. The use of ethanol as a hydrogen carrier for fuel cells deserves more research either for on-board or road-side reforming.

iv. Coupling biofuel production with carbon capture and sequestration.

Question 6.2

What are the prospects for second-generation biofuels that can be made from a wider range of biomass? Can they be expected to be cost-competitive with first generation biofuels and if so by when?

i. Outside the remit of the BEST project except that it is possible to configure 2nd generation biofuel production systems to produce ethanol and therefore to supply FFVs and Ethanol-buses, which if adopted in significant numbers now, will create a large market for those 2nd generation fuels when they arise.

Question 6.3

It is sometimes suggested that vehicles can travel more kilometres on a given amount of biofuel than on an equal amount (measured by energy content) of conventional fuel. Are any data or explanations available on this point?

i. Despite ethanol having a volumetric energy density[1] that is 65% lower than petrol it has some chemical and physical properties which can be exploited to enhance vehicle performance and engine efficiencies as follows.
   - Higher octane content of ethanol versus petrol can allow advanced ignition timing which some modern vehicles with anti-knock sensors and real-time engine management systems can take advantage of to improve efficiency
   - Ethanol's latent heat of evaporation can be exploited to improve volumetric fuel efficiency
   - Further improvements can be expected for engines specifically designed to run on high blend biofuels such as E85 / Flex Fuel Vehicles and future pure ethanol engines. Such improvements will include integration of the above mentioned options and in compression ratio / turbos.

[1] Energy densities assumed: ethanol - 21.3 MJ per litre (anhydrous ethanol). Petrol – 32.95 MJ per litre

- Further R,D&D work is clearly required to encourage and demonstrate that these improvements in efficiency are realized in practice.
- In practice, with current implemented vehicle technologies, the energy requirements per unit distance driven e.g. MJ per km, should be regarded as the same for petrol and ethanol-fuelled vehicles (all blends). Therefore, for example, volumetric fuel requirements per km for an FFV fuelled with petrol would be c. 7.1 litres petrol per 100 km and 9.7 litres E85[2] per 100 km.

Question 6.4

Problems have been reported in interpreting the directive's requirement on the calculation of the contribution of certain types of biofuel (notably ethers such as ETBE). Could the drafting of this directive be improved on this point? If so how?

[2] E85 is 85%$_{vol}$ anhydrous ethanol and 15%$_{vol}$ petrol. E85 energy density is 23.4 MJ per litre.