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**Subject: Report on the Hearing of the Biofuels European Technology Platform**

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## **1 Biofuels technologies: current state of the sector and anticipated developments**

In 2005, the total production of biofuels reached 0.8% of all EU-wide sold gasoline and diesel fuels<sup>1</sup>. Bio-ethanol and bio-diesel are the most common biofuels used in transport worldwide. In the EU, agricultural biomass is the dominating feedstock with rapeseed being the main raw material for bio-diesel production while cereals and sugar beets are the counterparts for bio-ethanol. There is presently a limited uptake of non-food crops. Forestry biomass is more dedicated to power and heat markets. Bio-ethanol production is currently based on a fermentation process of starch and sugar, while the production of bio-diesel is based on extraction, refining and esterification processes of plant oil, e.g. rapeseed and sunflower. It is considered that the existing, so-called 1<sup>st</sup> generation, technologies have intrinsic limitations in terms of cost and availability of raw materials, implying competition with food and other sectors. At present, bio-fuels blending limits in the EU are set according to conventional fuel standards (EN 228 for gasoline and, EN 590 for diesel fuels). These standards are mostly designed to ensure a compatibility with conventional power trains and refuelling infrastructure. It is noted that at the global level, there is an increasing diversification of blending grades and concentrations standards.

In March 2007, the European Council adopted a 10 % binding minimum target for the share of biofuels in overall EU transport petrol and diesel consumption by 2020. Based on the 2003/30/EC Directive, legislation in Member States (MS) is in place, with a tendency in many of them to rely on biofuels obligation coupled or not with fiscal incentives. In the short and medium term due to the fact that biofuels are unlikely to be cost-competitive with conventional fossil fuels, **market development and regulations** should continue to work in pairs. It is important that the regulatory and political framework combines market imperatives with policy benefits (Greenhouse gas (GHG) savings, secure and diverse energy supply, sustainability). For example, technically sound standards and harmonisation of regulations across the EU and overseas should be targeted, in parallel to the implementation of financial support that avoid excessive prices and unsustainable flows of biofuels. It is considered that

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<sup>1</sup> RES 2020 roadmap impact assessment SEC(2006) 1719

the use of obligation and tax exemptions are among the most interesting instruments to create a conducive framework to biofuels development.

The number of 1<sup>st</sup> generation based production facilities being constructed in the EU is steadily increasing. However, this development pattern is uneven across the MS. It is strongly correlated to the policy framework in place (obligation, tax incentives). In downstream areas (conversion process, product quality and use), there is a significant level of expertise across the EU, as a result of existing competences in the chemical, petrochemical and automotive sectors. European industry, for instance, has a leadership in biodiesel technology and production. In general, private investments in research and development (R&D) in these fields are gaining momentum. More than a lack of know-how, future biofuels developments are mainly linked to market expectation from the Industry to invest in advanced technologies.

Technological developments are currently driven by the needs to ensure cost-competitiveness, to have access to a wider array of feedstock and to increase the GHG reduction potential of biofuels from 50% to 90%. Interests and efforts on **2<sup>nd</sup> generation biofuels (ligno-cellulosic ethanol, Biomass to liquid)** are growing with demonstration and industrial projects being undertaken across the EU. These developments imply large investments both for proof-of-concept demonstration project (overcome technical barriers) and pre-commercialisation demonstrators (verify economies of scale). From one stage to the other, a change by a factor ten of the process scale is necessary. As a reference, investments for a 10 MW technical demonstrators are of the order of 40 M€. Hence, financial support that link benefits and risk is mandatory to attract investors. Until then, the shift from 1<sup>st</sup> generation to 2<sup>nd</sup> generation biofuels will be slow. Accounting for these dilemma and the medium term challenges, continuation of efforts on 1<sup>st</sup> generation processes should be guaranteed.

The adequate scale for industrial plants is still under consideration with two main trends. One is to build facilities matching biomass supply capacities. The other one is to build large facilities. At this scale, however, feedstock logistics starts being a limiting factor. Thermal conditioning of biomass (e.g. biomass pyrolysis) is currently investigating as a mean to overcome this limitation. It is reminded that to equal the production scale of conventional oil refinery, there is a need of 20 to 25 BTL plants with investment being 3 to 4 times higher per produced volume. To ensure economics, integrated concepts named as bio-refineries are considered in the future (market entry by 2030). The goal is to capture the highest added value per ha or per ton of biomass through economies of scale and multiple products strategies. Finally, the use of carbon capture and storage technologies is among technological development under investigation. However, the scale required to match the economics of a CO<sub>2</sub> infrastructure is a limitation.

Within the next 10 years, no new biofuel molecules are expected. The recently released initiative on biobutanol by BP is not considered applicable to meet the short to medium term challenges. Until 2030, the end-use development pattern for biofuels will continue to be dominated by a **compatibility paradigm with existing and foreseen evolution of conventional supply infrastructure and vehicle technologies**. The evolution of power trains taken into consideration by the Biofuels Technology Platform is derived from the EUCAR roadmap. It is reminded that beyond 5% either for bioethanol but also for current biodiesel, technical compatibility problems may arise either from the supply infrastructure or the vehicle technology. BTL diesel in that respect is instrumental to higher penetration as it is chemically much more compatible. The experts agreed that using higher ethanol blends with current vehicle technologies is a more complex issue. Nonetheless, in view of larger volumes of biofuels on the market, the cross-sectoral strategy proposed by the ETP experts is not to develop niche applications but rather to accommodate fuel specifications with the evolution of the entire fleet technology over time following a forward/backward approach. At such, the ETP experts recommend not disaggregating the 10% share per type of biofuels but rather

leave the market to decide within a sound regulatory framework rewarding the best benefit oriented fuels. The review of the fuel quality directive will also be contributory in that respect.

Most of the initiatives in the biofuels field are currently focussing on conversion and end-use sectors, with less structured efforts in upstream areas such as biomass resources and land uses. With increasing shares of biofuels in the EU energy policy, **securing and expanding feedstock supply** is more than ever a priority. Relying on Genetically Modified Organisms is one option to increase biomass yields but it is carefully considered as it is a sensitive issue. Ligno-cellulosic feedstock (e.g. short rotation coppice, forestry and agricultural residues, etc.) for second generation processes draw more and more attention due, for instance, to their higher productivity per ha coupled with the broader biomass fraction that can be mobilised for biofuel production. There is a need to support raw material producers to expand the raw material base. All in all, a pre-requisite for this feedstock expansion has to be the guarantee of the **sustainability of biomass and biofuels production as well as avoiding competition on raw resources**. At present, certification schemes are at an early stage of development. In line, a balance between domestic biomass production and international trade has to be found to secure EU jobs and economic growth.

## **2 Technology Penetration targets and the expected impact on energy policy goals**

Based on the ETP Vision, the Directive 2003/30/EC and the recently released minimum mandatory target for biofuels as part of the energy package endorsed by the European Council on March 8-9 2007, a 5.75% of the EU transport fuel consumption is targeted by 2010 and a minimum 10% by 2020. By 2030, up to one fourth of the EU road transport fuel consumption is proposed. According to the biofuels ETP roadmap, 2<sup>nd</sup> generation biofuels will be commercially available by 2020, but with a small contribution, acknowledging a broader expansion hereafter. The share of domestically produced biofuels and imports are still subject to debate for the 2030 target. Technically, the 2010 and 2020 targets can be achieved with current biofuels and engine technologies, along with a combination of domestic and imported biomass and biofuels. Hence, ETP experts consider that barriers to achieve these medium term targets are more on the market side (fossil fuel price and resource competition).

The following advantages were recognised during the hearing:

**GHG emission reduction:** Based on the following biofuels mix assumptions - 80% of 1<sup>st</sup> generation and 20% of 2<sup>nd</sup> generation biofuels by 2020, and 20% 1<sup>st</sup> generation and 80% 2<sup>nd</sup> generation biofuels by 2030 – and a 50% CO<sub>2</sub>eq reduction potential for 1<sup>st</sup> generation and 90% for 2<sup>nd</sup> generation, 5.8% of CO<sub>2</sub> road transport emissions can be reduced by 2020 with a 10% market penetration. This CO<sub>2</sub> reduction will be increased to 20.5% by 2030 corresponding to a 25% market penetration.

**Security of supply and energy savings**

For biofuels substituting diesel, an equivalent reduction of oil imports at the EU level is expected. As to gasoline substitution, no reduction of imports will be achieved at the EU level. Nonetheless, it is highlighted that it will contribute to the improvement of the global security of energy supply. Overall, gains in energy efficiency can not always be achieved by using biofuels. It is noted that this varies from one production pathway to another.

**Competitiveness**

Production costs of first generation biofuels are still high with regards to conventional fuels. 2<sup>nd</sup> generation biofuels costs are even higher at present. Breakthroughs on large scale gasification technology are still missing to make these processes economically feasible and attractive. Export of biofuels technologies is an important aspect for the competitiveness of the EU industry base and EU market deployment.

### **3 Interaction with other competing or synergetic technologies and community policies and initiatives**

Biofuels developments are strongly related to the EU energy and climate change mitigation policies. Per se, there is a strong interaction with the Common Agricultural Policy (CAP) and Forestry policies, as well as development, trade and industrial policies. There is a need for a harmonised and coherent policy framework as underlined in the EU Biomass Action Plan and the EU Strategy for Biofuels. As an example, the ETP experts stressed that the current orientation of the Common Agricultural Policy with a decoupling of subsidies and actual production as well as the annualisation of support regimes seems to be contradictory to biofuels developments. This can be a limited factor in terms of stakeholder's interests in turning to energy cropping. Trade policies are also crucial, notably with regards to bio-ethanol and the underlying question of competitive imports. This issue is addressed by the ETP, but it has not yet concluded on this matter. A strong interest for international cooperation has been expressed during the hearing both on technology (e.g. US, Canada) and resources (e.g. Latin America, Africa). More specifically, areas that could be considered for cooperation range from R&D and Demonstration initiatives to technology export, biofuels import and standards & regulations harmonisation.

### **4 The role of innovation**

The ETP experts consider that there is no insurmountable barriers, neither a need for drastic changes in the innovation system required. Current support programmes are well known. On the other hand, a better coordination of and more focused research, development and demonstration (R&D, D) efforts at the EU and national levels is identified as important to advance new technologies and overcome current technical and cost barriers. Ambitious public and private initiatives based on excellence, critical mass and oriented towards EU strategy priorities should be promoted as opposed to multiple small scale, fragmented initiatives. For 1<sup>st</sup> generation biofuels, the experts considered that research infrastructure and support instruments are not optimal but satisfactory. Nonetheless, there is a need to maintain and to streamline the efforts in a less fragmented way with more interdisciplinarity and alignment to EU policy strategy.

For 2<sup>nd</sup> generation biofuels, the challenges are more acute. The R&D, D infrastructure and promotion instruments are not available yet. There is a crucial need to demonstrate the technology at a relevant industrial scale prior to 2020 commercialisation target. These operations are costly. A long term and coherent policy framework and innovative financing mechanisms that pool together government, industrial and investor's resources need to be put in place. Equally, more R&D, D efforts should be devoted to upstream areas, e.g. land use, improved and new energy crops. It was further expressed that the setting of objectives at the EU level should go hand in hand with the development of an EU research base. At present, most R&D and D initiatives are still stemming from national levels and/or from a bottom-up approach. The build-up of a knowledge community on biofuels at the EU level is therefore perceived as an important priority.

The biofuels sector involves many stakeholders from different horizons. An overall cross-sectoral coordination between agriculture, forestry, oil industry and car manufacturers is therefore of paramount importance. Further use of existing coordination instruments such as ERA-nets, technology platforms is recommended. In parallel, there is a need to ensure social acceptance of biofuels. One way is to set-up sustainable biomass and biofuels production and consumption chains and to better communicate to society on the benefits of using them.

## **5 Platform recommendations for Actions to be considered in the SET-Plan**

The hearing did not produce a clear recommendation for a large scale initiative to be undertaken at the European level to promote further the use and deployment of biofuels. A set of potential actions that could be part of the SET-Plan has been identified. The ETP experts stressed the importance for increased, more flexible and more focused public support to R&D and D activities (e.g. through the seventh framework programme). Support to initiatives on short and long term developments should foster excellence and critical mass and promote coordination between stakeholders to ensure compatibility of current and future developments from feedstock to delivery and end-use. Some areas of specific interests have been emphasised such as biomass agricultural land and forest use, process improvements of current generation biofuels processes, technological breakthroughs for ligno-cellulosic biomass conversion processes, by-product valorisation as well as support to all links of the "technology value chain". Equally, the setting up of large demonstration initiatives for 2<sup>nd</sup> generation biofuels, but also for current generation plants with significantly improved performance, and for biorefinery concepts has been identified as another important priority to foster the deployment of biofuels. These projects are crucial to acquire feedback on and to validate cost and technical performance at a relevant industrial scale. Financial support and incentives are needed for undertaking demonstrations of advanced technologies. In parallel, there is a strong need for new initiatives on agricultural and forest biomass production. Furthermore, the use of the future European Institute of technology as a vehicle to build-up and foster a knowledge community on biofuels at the EU level has been proposed. This institute could focus on, for instance, specific areas that are critical to the competitiveness of the European biofuels industry.

Finally, it is underlined the necessity for an overall harmonisation of incentives and regulations across the EU as well as the set-up of sustainability certification schemes in view of avoiding market distortion and competition, and the development of resources mapping and decision-making support tools.

No resource estimate to carry out these initiatives has been provided during the hearing.