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Direction Générale de la Mobilité et des Transports
200 rue de la Loi
1049 BRUXELLES
MOVE-ENER-MAIL@ec.europa.eu

RE: Contribution of the Methanol Institute to the EC Expert Group on Future Transport Fuels

Introduction

The Methanol Institute (MI) is a non-profit trade association dedicated to supporting the greater use of methanol as a clean energy resource. MI's membership roster includes a number of Europe's leading chemical companies/distributors including: BP Chemicals; Ecofuel; Ferrostaal; HELM AG; Johnson Matthey; Methanex Europe; Solvadis; and Süd-Chemie. Our sister organization, the Methanol Foundation, is a non-profit scientific and educational organization that focuses the resources of public, private, non-profit and academic organizations to advance technologies for methanol production and use.

The MI is in agreement with other stakeholders who consider that in its search to reach the objective of reducing CO₂ emissions by 80% by 2050, the EU will need to find a balance between fuels, vehicle technologies and infrastructure that is affordable, competitive and secure. The maturing of EU economies, including the ageing of its population, and the increasing competition from emerging economies is a reality that may force the EU to scale back alternative technologies like electric vehicles if they prove to be too onerous.

We believe that an environment that allows for the gradual de-carbonization of the EU's automotive transport system between now and 2050 by mixing an increasing volume of bio-fuels in the existing gasoline pool is the most realistic and affordable path forward in the short-to-medium term. The increased introduction of bio-fuels will help move towards the direction of achieving the EU's long-term goal CO₂ emissions reductions. In the long-term, there might be a need for a radically different technology that has currently not yet emerged.

The European Commission has been following the bio-fuels path since 2003 by publishing its Directive 2003/30 designed to promote the usage of bio-fuels and other alternative fuels in road transport. Since then, more legislation was passed with the Fuel Quality Directive (2009/30/EC) and the directive on the promotion of the use of energy from renewable sources (2009/28/EC). This new legislation has sought to impose minimum levels of renewable fuels in transport, set targets for the reduction of life cycle greenhouse gas emissions of gasoline and diesel fuels, and establish minimum standards for the CO₂ reductions of individual bio-fuels. These directives have all recognized the potential of bio-methanol as a renewable energy source, with a particularly high GHG emission reduction potential. Additionally, bio-methanol can

be used as a feedstock for the production of Dimethyl Ether or “Bio-DME,” which can be an important diesel fuel substitute.

In order to achieve these objectives, there is a need for the automotive industry to increase the production of Flexible Fuel Vehicles (FFV’s) that can run indifferently on gasoline, ethanol or methanol fuels. According to the car industry, current gasoline engines can only accommodate a limited percentage of alcohols like ethanol, mainly because of drivability, emission, and material compatibility issues. In the U.S. Congress, a bi-partisan bill -- the Open Fuel Standard Act (S. 835/H.R. 1476) -- was introduced last year that would require automobile manufacturers to ensure that not less than 80 percent of the automobiles manufactured or sold in the United States by 2015 are capable of operating on fuel mixtures containing up to 85 percent ethanol, 85 percent methanol, or bio-diesel. We think the EU should consider similar legislation.

Specifically, methanol can meet the following objectives when used as a fuel in combustion engines, as outlined hereafter:

- Emission Reduction
- Compatibility with Present Vehicle Technology and Fuel Distribution Infrastructure
- Gradual shifting away from fossil fuels
- Security of Supply
- Affordability

Emissions Reductions

As an oxygenate, the presence of oxygen in the methanol molecule allows for better combustion and higher fuel efficiency. Conventional methanol produced from natural gas when used as a transportation fuel results in decreases in hydrocarbon, toxic, and carbon monoxide emissions compared with gasoline.

While methanol is currently produced mainly from natural gas and coal, the great potential of methanol for substantially reducing GHG emissions lies in the possibility to produce methanol from wide array of bio-mass feedstock resources. Commercial production of bio-methanol has started in 2009 in the Netherlands, where BiMCN has converted a conventional methanol plant using natural gas as feedstock to allow bio-methanol production from crude glycerine, a residue from bio-diesel production. As well as being green, the great benefit of bio-methanol is that it can be used in similar engine and fuel systems to those found in today's cars. It can be stored, transported and sold in much the same way as gasoline and diesel.

Methanol can also be obtained from other forms of biomass such as wood, black liquor, algae or urban garbage. In order to ensure sustainability and to avoid the food versus fuel debate, we believe it is best to use renewable feedstock exclusively derived from organic waste materials and crops other than those used for food consumption.

The feasibility to use CO₂ emissions from industrial manufacturing facilities and electric power plants as feedstock for sustainable methanol production is also being demonstrated on a commercial basis.

Compatibility of methanol with present vehicle technology and energy infrastructure

Methanol, like ethanol can be used in low-level blend proportions with gasoline in existing modern combustion engines. In fact the Fuel Quality Directive allows the use of up to 3 percent methanol in gasoline with an equivalent amount of co-solvent. It is a liquid that is completely miscible with gasoline. It

has a long history of use in racing vehicles where it is valued both for its high performance properties and its safety aspects.

The key for the further development of biofuels like bio-methanol (and ethanol) as alternatives to gasoline is the developments of Flexible Fuel Vehicles. Some U.S. and Chinese car producers have already launched mass production of FFV's for their local market. European car manufacturers can follow that path as well.

Only minor adjustments are needed to be made to existing car fuel systems transportation fuel infrastructure compatible with or high-level methanol blends. Experience has shown that the cost to provide ethanol/methanol/gasoline flexible fuel capability to any new car is less than €80, while the cost to install an alcohol compatible fueling tank and pump is less than €50,000. Clearly, these minimal costs are well below that of more radical alternatives (like electric, hydrogen or CNG cars).

Dimethyl Ether (DME) as a Renewable Fuel

Our comments here are also focused on the role of Dimethyl Ether (DME) produced from a biomethanol feedstock as a “renewable fuel.” The simplest ether, DME is commonly used in aerosol spray propellants as a chlorofluorocarbon (CFC) replacement and as a blend-stock with liquefied petroleum gas (LPG) for home heating and cooking. DME is also emerging as an energy resource for a growing number of applications from its use as a clean-burning transportation fuel, a fuel for electric power generation, and as an input in the production of olefins, synthesis gas and hydrogen. With physical properties just like propane, DME is a slightly pressurized gaseous fuel.

An environmentally-friendly automotive fuel, DME made from renewable sources (Bio-DME) has properties similar to LPG as well as impressive environmental characteristics. DME is an excellent diesel fuel with a high cetane number (greater than 55), near-zero formation of particulate, zero sulfur content, a less complicated exhaust clean-up (no urea). DME based on renewable feedstock is the most efficient fuel when the entire chain is taken into account. DME can be up to five times more efficient than traditional fuels, resulting in less energy wastage and better use of our resources.

Vehicle fueling systems designed to use DME can use through injection, while the on-board emissions systems require no particle filter and no three-way catalyst. Other advantages of DME include production efficiency, high conversion efficiency, and moderate production plant costs through commercially available synthesis technology. DME diesel fuel provides smokeless combustion, low CO₂ and 90% less NO_x emissions than standard automotive fuels. DME is a colorless gas that is biodegradable, non-corrosive, and will not contaminate soil or aquifers in the event of a leak. For automotive use, DME has the highest total efficiency of all synthetic liquid fuels (e.g. Fischer–Tropsch diesel) and a 30% higher fuel economy than gasoline in passenger cars.

Gradual shifting away from fossil fuels

The transportation sector is currently highly dependent on oil-based fossil energy. We believe that a shift away from fossil fuels can only be very gradual, assuming no breakthrough technology. The EU strategy of moving away from fossil fuel needs to allow for this gradual shift. An ideal situation would be to have a fossil fuel-based blending component readily interchangeable with a bio-fuel component. This is exactly the case with bio-methanol which shares the very same molecular structure as fossil based methanol. As bio-methanol production develops, it would displace natural gas/coal based methanol production without the consumer even noticing it.

Europe is now leading the way in the development of bio-methanol fuels. In addition to the work in the Netherlands using glycerine as a feedstock for biodiesel production, in Sweden, Chemrec is building a plant to produce bio-methanol and bio-DME from black liquor (a by-product of pulp and paper mills). Iceland recently broke ground for a methanol plant named for Nobel Prize Laureate and author George Olah that is using waste CO₂ and hydrogen produced from geothermal power to produce renewable methanol, which will be used as a transport fuel. We are seeing similar developments in North America and Asia.

Security of energy supply to transport by providing diversification of energy sources and suppliers

There are currently two key alternative sources of hydrocarbons that, together with crude oil represent more than 85% of the energy used by mankind today. These are coal and natural gas: a solid and a gas. As a liquid fully miscible with gasoline that uses natural gas and coal as feedstock, methanol provides the ideal link between those alternative feedstocks and the existing gasoline pool. By blending methanol with gasoline components, the EU would significantly increase the diversification of its energy sources for transportation.

This available alternative to oil for transportation use has not escaped China, a country with substantial coal reserves, which has been promoting the use of methanol as a gasoline component. In 2009, China blended nearly 5 million metric tonnes of methanol in gasoline to run cars, trucks and buses. With total gasoline consumption in China last year of roughly 53 million tonnes, the Chinese use of methanol blended fuels represents one of the world's leading markets for alternative fuels. Not only is the use of methanol as a transport fuel in China helping to diversify that country's energy supply mix, it is also helping to reduce urban air pollution, and it's providing consumers with a significant cost savings.

Affordability

As already developed, we believe that only minor adjustments to the existing fuel systems and distribution infrastructure are needed to facilitate the greater use of alcohol fuel across the EU, which can be achieved at a fraction of the cost of radically different technologies.

Methanol produced from natural gas and coal has for decades been a competitive energy source with oil. This is due mainly to the availability of large quantities of these feedstocks in remote places around the globe. We believe that bio-methanol production will offer an economical and environmentally superior alternative to the transport fuels currently being utilized.

As the Expert Group on Future Transport Fuels continues its discussions, we would be happy to work with you to consider the role of methanol and bio-DME as key parts of the solution to the EU's transport future.

Kindest regards,



John Floren, Chairman, MI Board of Directors
Senior Vice President, Methanex