1. CONCLUSIONS AND MESSAGES FOR POLICY-MAKERS

Although this summary does not pretend to present a unanimous or negotiated position for the participants at the Round Table, a number of conclusions did enjoy broad support.

1.1 Performance of biofuels in reducing greenhouse gas emissions

Discussions at the Round Table underlined the wide range of performance of biofuels in terms of life-cycle energy and greenhouse gas emission balances. Performance differs between fuels and even for a single fuel and feedstock, performance varies greatly according to production process and farming practice. In the worst cases biofuels result in significantly higher emissions of greenhouse gases than gasoline or diesel.

The discussions also identified a wide range of uncertainty in the estimation of emissions of CO_2 from the soil and emissions of N_2O in the cultivation of feedstocks. These emissions vary according to soil type and farming technique and can account for a large part of the overall greenhouse gas emissions for some conventional biofuels.

For biofuels that provide relatively low greenhouse gas abatement (up to around 30%), such as ethanol produced from corn and many other grains, the range of uncertainty can be larger than the average expected benefit. Therefore there is a risk that such fuels provide no benefit or even produce higher rates of greenhouse gas emissions than oil products.

On a small scale, biofuels are currently produced from whey and waste cooking oil with relatively large greenhouse gas savings compared to fossil fuels, of around 70%. The only large-scale production of biofuels to approach this level of performance is Brazilian sugar cane ethanol. However, it requires tax subsidies to be viable, amounting to around USD 1 billion a year.

Most other large-scale biofuel production (ethanol from sugar beet and sorghum; biodiesel from rape, soy and palm oil) achieves around 30% to 50% greenhouse gas savings, but requires large subsidies.

1.2 Costs and alternative policies

Views differed over just how much biofuel could be produced sustainably. But most biofuels are expensive, particularly when environmental costs are factored in. Only at sustained high oil prices are biofuels likely to be produced commercially. With subsidies restricted to a level that reflects their contribution to greenhouse gas mitigation, much production would cease.

Improving energy efficiency in transport has much greater potential, and at lower cost, than promoting biofuels for reducing energy supply vulnerability and reducing greenhouse gas emissions.

Taxes related to the carbon content of fuels, including for biofuels, would also be more cost-effective than subsidies or biofuel targets as they target CO_2 emissions directly. Fuel excise tax systems are very similar to a tax on the carbon content of fuels, albeit at a high rate in some cases. In Europe, current excise rates are roughly equivalent to a carbon tax on petrol and diesel of around EUR 200/t $CO_{2\text{-eq}}$, around ten times the current cost of CO_2 in the European emissions trading system. Support for ethanol in the USA is currently estimated to cost double this level at the country's best performing ethanol plants. The same is true for rapeseed biodiesel produced in the EU.

1.3 Advanced biofuels

Future generations of biofuel feedstocks and production processes are likely to have lower greenhouse gas emissions and may be more cost-effective. Such biofuels may be able to meet up to 10% or 20% of current transport energy demand, but no more than this without major advances in technology (Jones 2007).

Ligno-cellulosic ethanol produced from some feedstocks in pilot plants already performs much better than most conventional biofuels in terms of greenhouse gas emissions and performs as well as the best Brazilian sugar cane ethanol. However, the economics are unproven and for large-scale production the potential supply of ligno-cellulosic ethanol is limited by cost and the land available for energy crops. There is a rationale for supporting research on advanced biofuels but this does not extend to open-ended support.

1.4 Effectiveness of subsidies

Subsidising large-scale production and consumption of conventional biofuels fails to deliver a significant contribution to the strategic goals of reducing greenhouse gas emissions or improving the security of supply of fuels for transport. It is an inefficient way of providing income support to rural communities and it consumes large amounts of taxpayers' money (USD 4 billion in 2007 in the USA in tax subsidies alone; USD 4 billion in 2006 in the European Union in tax subsidies; and between USD 13 billion and USD 15 billion in the OECD as a whole for support overall), without commensurate benefits. Germany has now begun to reduce subsidies for biofuels and the United Kingdom is expected to reduce the current excise duty differential of 20p/litre (EUR 0.29/litre) over time.

1.5 Policy reform

Volumetric production targets for biofuels fail to provide incentives to contain costs, to avoid environmental damage or even to ensure greenhouse gas emission reductions are delivered. Carbon content targets for fuels, accompanied by certification, are a better alternative.

California, the Netherlands, Germany, Switzerland, the United Kingdom and the European Commission are developing systems of certification to regulate the market for biofuels. These systems are aimed at improving environmental outcomes. If governments continue to promote biofuels, then greater selectivity is needed in the choice of producers and processes to be subsidised. Without this refinement of policy, through certification linked to subsidies, although there may be progress towards targets for production and consumption of biofuels, there will be disappointment

in the higher level objective of reducing greenhouse gas emissions. Moreover there are likely to be unwelcome side effects for other sustainability goals.

It should be noted that certification systems are not well suited to addressing the indirect impacts of biofuel production. Certification can only guarantee to influence the supply chain. It can be used to modify farming and biomass harvesting methods in order to limit the environmental impacts of farming. But certification can not be used to control any displacement of existing farming activities induced by an expansion of biofuel production, with consequent land-use change outside the area farmed to produce biofuel. Separate measures will be required to protect valued natural and semi-natural ecosystems, from all kinds of development.

The range and sometimes poor performance of today's biofuels in terms of greenhouse gas emissions is in part a result of the absence of regulations or incentives to select biofuels according to their environmental profile. The challenge for the development of biofuel certification systems is to provide such incentives cost-effectively.

2. INTRODUCTION

Government support for the production of biofuels has been motivated primarily by agricultural and energy policies with the aim of substituting biofuels for imported oil and supporting farm incomes and agricultural sector industries. More recently support for biofuels has become a core part of many national policies for reducing transport sector CO_2 emissions. The relative importance of each driver differs between governments.

Subsidies for biofuels are growing rapidly and are estimated to have reached around USD 15 billion in 2007 for the OECD as a whole. Many governments have also imposed biofuel quotas for oil distributors. The European Union requires Member States to take measures to ensure that biofuels account for 2% of the demand for transport fuels, rising to 5.75% in 2010. The European Commission proposes increasing the target to 10% by 2020[1]. The US Government set a target of 4 billion gallons of ethanol for 2006, nearly 3% of the gasoline market, and has proposed a target of 35 billion gallons of biofuels production by 2017, which is expected to account for about 9% of transport sector fuel consumption.

However, all biofuels are not equally effective in substituting for oil or in cutting greenhouse gas emissions and promoting their production can have unintended consequences. Subsidies for biofuels, and the resultant increase in demand for grain and oil seeds, appears to have contributed to sharp increases in food and livestock feed prices in world markets, in a context of rising demand for these commodities for traditional uses. Also, depending on feedstock and farming practices, biofuels production can have significant environmental costs. These include degradation of biodiversity and soil fertility and increased rates of soil erosion, excessive water abstraction and water pollution. In some circumstances, biofuel feedstock production can even result in a net increase in greenhouse gas emissions.

The Round Table brought together 50 leading researchers on the science and economics of biofuels to examine the potential for these fuels to fulfil the policy expectations underlying their