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BIOFUELS - THE ROLE OF ADVANCED BIOFUELS AND WHY WE NEED TO GET THERE SOONER

Introduction

Thank you for the opportunity to join the discussion today on behalf of BP Biofuels.

I'm here to talk about the role of advanced biofuels and why at BP we believe we need to get them into the market sooner.

We believe this is necessary if biofuels are to fulfil their potential. Biofuels have a great future in the long term - but only if they overcome a series of hurdles in the short term.

Let's not lose sight of the prize. Biofuels should become the primary means of bringing secure, sustainable, low-carbon fuel to vehicles in the next two decades. Projections of course vary but our best estimates – probably similar to many of yours – suggest biofuels will account for up to 20% of the market by 2030, possibly more.

That is ambitious, but it's compatible with current targets such as the EU's plan for 10% of transport fuel to come from renewables by 2020 and the US's plans to increase the volume of biofuels in use from 9 billion gallons last year to 36 billion in 2022.

However biofuels will not achieve this scale unless they make advances.

They need to be less expensive than many biofuels are today. Policy-makers will not protect biofuels forever and they need to be able to compete with crude as a source of motor fuel.

They need to be lower in emissions than many biofuels are today. Climate change is a major driver for the rollout of biofuels and increasingly the advantaged fuel will be the low-carbon fuel. We need fuels that are indisputably green.

Biofuels need to be scalable. Feedstocks, production facilities, distribution, infrastructure – all of these need to be developed on a completely different order of magnitude to today.

Most important, biofuels need to be sustainable – sustainable in an economic sense – as I've said – but crucially sustainable environmentally.

So, what is an advanced biofuel? It is one that has surmounted these hurdles to become low-cost, low-carbon, scalable and sustainable.

I'd like to talk a little about each of these factors and then briefly summarise how we're trying to achieve them in BP's biofuels business.

1. Sustainable biofuels

I'm going to start with sustainability for the very simple reason that I believe sustainability is our licence to operate. As an industry, if our products are not demonstrably sustainable, we will falter and eventually fail.

There are various issues related to the sustainability of our products, all of which need to be clarified and resolved.

Much of the controversy and confusion arises from the debate over indirect land use change, or 'ILUC'. This debate particularly needs to be resolved so that our industry is not damaged in its infancy.

A lot of the work in this area still has wide error margins and we need to understand the relative impact of biofuels compared to other drivers of land use change, such as logging and subsistence farming.

There is no credible evidence that links biofuels expansion to indirect conversion of high-carbon value land types to any large degree. And if actions are only focused on the biofuels industry, more significant causes of land use change will be missed.

In fact, we believe that there is sufficient degraded, abandoned and low-carbon value land available to meet the land requirements for biofuel needs, as well as food and feed, without adverse impacts on bio-diverse habitats, forests and other valuable areas.

For example, two weeks ago a report from the UK's Renewable Energy Association showed that the EU has the potential to more than fulfil its ethanol demand up to 2020 purely from domestic production.

That finding was corroborated in a peer review by Imperial College London and it takes account of factors such as expected yield improvements and the replacement of a proportion of feed crops by the biofuel by-product DDGS.

We also need to factor in the different impacts of different crops. For example, cellulosic ethanol and sugar cane ethanol use land much more efficiently than corn ethanol.

The debate also needs to take account of improvements in yields and how these are accelerated by biofuel cultivation. In Brazil for example, not only has sugarcane productivity grown at twice the global rate since the ethanol industry became established, but the growth rate of maize yields has also more than doubled. That is a positive knock-on effect - an indirect agricultural productivity gain.

But we are not complacent. We agree that high carbon value land, such as rainforests, peat soils and so on, should not be converted for biofuel crop production – or for any other reason.

What is needed is a good land management strategy to address direct land use change. Some countries are ahead of the game in this, notably Brazil with its

plans for agro-ecological zoning. The proposed laws there allow for a major expansion of sugarcane planting – from 9 million hectares to around 65 million (an area larger than France), but they prohibit planting in the valuable bio-diverse cerrado area which makes up about 20% of Brazil's land.

Incidentally, the Brazilian government points out that 99.7% of the country's sugarcane plantations are as far from the Amazon as the Vatican is from the Kremlin.

We also support certification which rewards those biofuels that are good for the environment, provided it is based on the best science. This is the kind of certification that is now seen in the EU's Renewable Energy Directive and the UK's Renewable Transport Fuels Obligation.

At the operational level, all operators need to act responsibly in their own land management by such measures as tree planting and creating set aside areas to protect biodiversity and water-ways.

We also need to set standards within the industry – working with governments, NGOs and others. That is why BP has become an active member of multi-stakeholder initiatives such as the Round Table for Sustainable Biofuels, the Better Sugarcane Initiative and other bodies.

Calculations also need to factor in what would happen without biofuels – the 'environmental opportunity cost' in terms of emissions from fossil fuels that would be generated instead.

And you can't just say 'biofuels are too complicated, let's use other options' – because other options also face major challenges.

Ten years ago hydrogen fuel cells were all the rage. Today people realise the obstacles they face in storage, distribution, infrastructure and safety.

Electric cars are now in the spotlight. Yet they are also an uncertain route to cutting emissions – chiefly because of the carbon intensity of the grid in many countries. Your electric car today in many markets is to a large degree a coal car.

Advanced biofuels, on the other hand, need no new infrastructure and have no issues of distribution or storage. Advanced biofuels are the only source of secure, scalable, competitive, low-carbon transportation energy for the future and we simply have to make them work.

If we have sustainable fuels, then we have a licence to operate – we're on the starting line.

2. Low-cost biofuels

The next hurdle to overcome is cost. In the medium term, biofuels cannot expect ongoing taxpayer subsidy. They will need to compete with crude oil as a feedstock in a world where the only support is provided by a more widespread and robust carbon price.

Our benchmark for success is $1 a gallon – or $40-50 a barrel on a straight volume basis. In our view if you can't reach that level then it's won't be worth competing.

The ace in the hand is feedstock. Feedstock that is resource efficient, carbon efficient and cost efficient. To look at the future realistically, we need to measure biofuel feedstock on the same scale as conventional transport fuel feedstock – in other words crude oil.

Using a number of sources, we've created one possible cost curve for the fuels market for 2020. In this projection, OPEC countries still provide the most economical feedstock, followed by crudes from the FSU and elsewhere, but Brazilian sugarcane ethanol competes very well as part of the mix, having similar costs to oil sands or crude produced using enhanced oil recovery.

A little further up the scale comes ligno-cellulosic ethanol. This reflects our view and our experience of the potential for cellulosics to become competitive, driven by advances in cultivation and technology.

In this projection we see around 6 million barrels per day of biofuels in the pool - which is a five fold increase on today.

And incidentally, the performance of sugarcane ethanol explains why we usually talk about 'advanced' biofuels rather than 'second generation' ones. The fact is that advanced biofuels are being produced and used now.

3. Low-carbon biofuels

The third hurdle to cross is making biofuels genuinely low-carbon. This depends on several factors.

First the fuel needs to demonstrate significant net reductions in emissions -from well to wheels – or 'plough to piston'. As stated, we agree that this needs to include certified sustainable agriculture with no unacceptable land use change.

Second, the crop needs to have a high yield, thus providing superior emissions reduction per unit of cultivation.

You get fewer than 4,000 litres of ethanol from a hectare of corn with a good deal of fertiliser, whereas you can get around 7,500 litres from a hectare of sugar cane and it can be grown on under-utilised land irrigated using only rainwater. The co-products of bagasse and vinasse can be used for power and fertilisation, creating a self-sustaining system. Ligno-cellulosic crops such as energy grasses can be grown intensively to great heights and produce yields of 7,000 to 14,000 litres per hectare. The more of the crop you can use for fuel, the greater the GHG benefit. Cellulosics can also be grown on marginal land.

These variations lead to very different outcomes in terms of greenhouse gas reductions, with sugarcane and cellulosic fuels ahead of the pack and EU wheat ahead of US corn.

4. Scalable biofuels

The final hurdle is scalability. Can biofuels be grown, produced, distributed and used on a scale necessary to account for a fifth of all transport fuel?

Several factors will contribute to scalability. I've covered improvements in feedstock and carbon reductions, both of which are critical.

Another issue is the form in which the fuel reaches the tank - the nature of the product or molecule.

Bioethanol is dominant today, but it has several downsides. It attracts water and can be corrosive. It can't be used within today's infrastructure of pumps, pipes and refineries. And it can only be used in blends of 10% or less in unmodified engines.

Fortunately we can develop superior molecules that will resolve this issue. In particular, biobutanol provides a door through the so-called 'blend wall'. It can be blended in concentrations of up to 16%. It doesn't mix with water so can easily be used in existing infrastructure. It provides greater fuel economy. It can be used in conjunction with ethanol. And it will be possible to retrofit ethanol plants to make butanol.

Biodiesel presents a different sort of resource constraint. The oil-based feedstocks prevalent today are relatively low in yield and raise some of the biggest concerns over sustainability. Alternatives are needed and some operators are looking at photosynthetic approaches. We see a more attractive option in heterotrophic routes, making diesel from sugars using a conventional fermentation process to convert them to lipids and thence biodiesel through chemical or thermocatalytic processes. This opens up the whole range of feedstocks, including sugar cane, energy cane, energy grasses and other cellulosic materials. Biodiesel produced in this way will also offer the potential to deliver greenhouse gas emission reductions of up to 80-90% compared to traditional fossil fuel.

Meanwhile, there may be even better feedstocks, processes and molecules out there for the future. The confluence of the worlds of energy and biotechnology is in its infancy and we need to make substantial R&D investments to see where it can take us.

So what is BP doing to put this analysis into practice?

First of all we have invested in the most sustainable and competitive biofuel available today – sugarcane ethanol. Our joint venture, Tropical BioEnergia, is already producing ethanol in Brazil. The first refinery opened last year and has a maximum capacity of 435 million litres a year. Another refinery is planned as part of a total investment of $1 billion.

We've set out to make the refinery a role model for sustainability, with waste bagasse used for power, spare power exported to the grid and vinasse used in place of fertiliser. We've planted 50,000 trees to minimise soil erosion, protect waterways and promote biodiversity. And another 25,000 will be planted next year.

Looking to cellulosic options, we have formed a JV called Vercipia Biofuels with Verenium Corporation, centred on the technology Verenium has developed to release the sugars locked up in the cell walls of the plant.

This process is now being demonstrated at a plant in Jennings, Louisiana. It uses speciality enzymes and proprietary fermentation organisms to break solid cellulose down to a six-carbon sugar while five-carbon sugar is processed separately as a liquid. This enables us to use as much of the crop as possible. We're also using very tall, high yielding grasses.

This combination has the potential to deliver three to four times more ethanol from every acre of feedstock than can be derived from corn.

We are planning a commercial scale facility at Highlands Country Florida where we will produce 135m litres (36m gallons) a year from crops which we expect to yield 18-20 dry tonnes an acre. We expect to break ground in 2010 and be operating by 2012.

As I mentioned, we believe biobutanol has many advantages over ethanol and our aim in this area is not only to manufacture the molecule ourselves but to provide the technology and infrastructure for biobutanol facilities worldwide.

To do this, we have a JV with DuPont called Butamax Advanced Biofuels which is working towards a first commercial plant by 2013. We are already on the way. We have carried out extensive testing, covering over 1.3 million miles of road. These tests confirmed that vehicles performed excellently with biobutanol blended at a 16% volume[1] and that the fuel is compatible with existing fuel infrastructure. Butamax has developed multiple biobutanol producing microbes that are proving more cost-effective than the current commercial standard and the specific isomer that we are working on is the high octane bioisobutanol. BP and DuPont are now building a demonstration facility at Hull in the UK which will be operational next year. And we will be developing process design packages to enable current ethanol facilities to be converted to produce biobutanol.

One such plant will be the ethanol facility that we are constructing – also in Hull, UK – through the Vivergo JV with DuPont and Associated British Foods. This will be a state of the art manufacturing centre, which we expect to provide around 420 million litres of ethanol a year, which is around a third of the total UK ethanol requirement under its Renewable Transport Fuels Obligation.

It will use feed-grade wheat and will create DDGS protein feed as a co-product. It will use a combined heat and power unit located at a nearby BP site. And these factors contribute to a good GHG balance with an estimated reduction in emissions of more than 50% on conventional gasoline.

We've also announced a $10 million investment in a research programme with Martek Biosciences Corporation to pursue the sugar-to-diesel route for biodiesel. Martek have substantial experience in working with micro-organisms to create

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A 16% biobutanol blend has equivalent oxygen content to a 10% ethanol blend.

nutrition products and this is an exciting opportunity to apply that capability and technology to energy.

In terms of research, we are also investing $500 million over 10 years in the Energy Biosciences Institute which is the world's first research centre solely dedicated to applying biotechnology to energy. It's a collaboration between BP, the Lawrence Berkeley National Laboratory and the universities of California and Illinois.

As well as researching many topics around advanced biofuels, the EBI has also launched a major programme on the social, economic and environmental implications of biofuels, with projects on a range of topics from productivity to food security and water quality to engagement with stakeholders.

So this is our strategy for advanced biofuels: Today we're investing in sugarcane ethanol, the world's most sustainable biofuel; and we're demonstrating cellulosic ethanol. By the end of next year, we'll be demonstrating biobutanol, constructing a large-scale cellulosic biofuels facility and growing our sugarcane business. In a few years we'll have commercial scale cellulosic and biobutanol facilities up and running. And all the time we're running a continuing research programme through the EBI and initiatives like our partnership with Martek, scanning the horizon for the next steps forward in commercial application of biotechnology to energy.

At each stage we're working with highly experienced, carefully chosen partners who bring great technologies and capabilities to the BP biofuels community.

3. Support from policy-makers

The final factor affecting the future of biofuels is the policy factor.

Our vision is of a time when advanced biofuels will compete within a market where the only policy intervention is the pricing of carbon.

At the moment, however, some transitional support is also required. This means policies that reward high performance in reducing greenhouse gas emissions rather than using volume mandates that simply encourage more of the same. And I must recognise and welcome the fact that the EU's Renewable Energy Directive does have mandatory sustainability targets to ensure that increasing proportions of biofuels really do reduce emissions. It means insisting on transparency in showing where biofuels come from and reporting on performance in detail. It means supporting innovation with regulatory mechanisms that apply evenly across a market so the best technology emerges. It means removing tariff barriers to allow the market to work most efficiently.

And we urge policy-makers not to make hasty policies based on claims over land use without in-depth research and measures to distinguish between sustainable and unsustainable fuels.

Conclusion

In concluding, let me return to my title. Why do we need to get advanced biofuels into the market sooner?

It's because we do not want their promise to be wasted. Currently the debate around biofuels is creating a lot of uncertainty. We need to answer that uncertainty with action – by showing that advanced biofuels can be low-cost, low-carbon, scalable and sustainable.

For us the case for advanced biofuels is compelling. The opportunity to build a major new business is exciting. The scope for new partnerships is stimulating. And the next few years are going to be fascinating. Thank you.