Biofuels: a growing alternative

Philip New, CEO BP Biofuels

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1. Introduction

Good evening.

Thank you for inviting me to speak here today. This is a brilliant initiative for which Linklaters should be congratulated.

You have had some very eminent speakers in the past - I hope that this evening we can live up to the standard set in previous seminars.

I'm delighted that a great panel of experts and insiders have been able to join me. We're all looking forward to a good conversation about that most intriguing and controversial of energy options: Biofuels.

This is a topic that may appear to be relatively narrow in contrast to some of the grand themes that have been covered in past seminars.

But it is a topic that is particularly interesting:

Here we see the challenge of bringing together humanities' two most important value chains – agriculture and energy – for the first time.

Here, we have the challenge of embracing new technologies, like synthetic biology.

Here, we have the potential to build a major new global industry, and here we have a possibly unique arena, in which the dilemmas created by the interconnectedness of the big 21st century issues of energy security, climate security, food security and water security, will play out.

I am convinced that biofuels, when done well, are able to address these issues; that they will play a key role enabling sustainable transport and that they offer a significant business opportunity.

This evening I'd like to explain why that is the case, in three chapters:

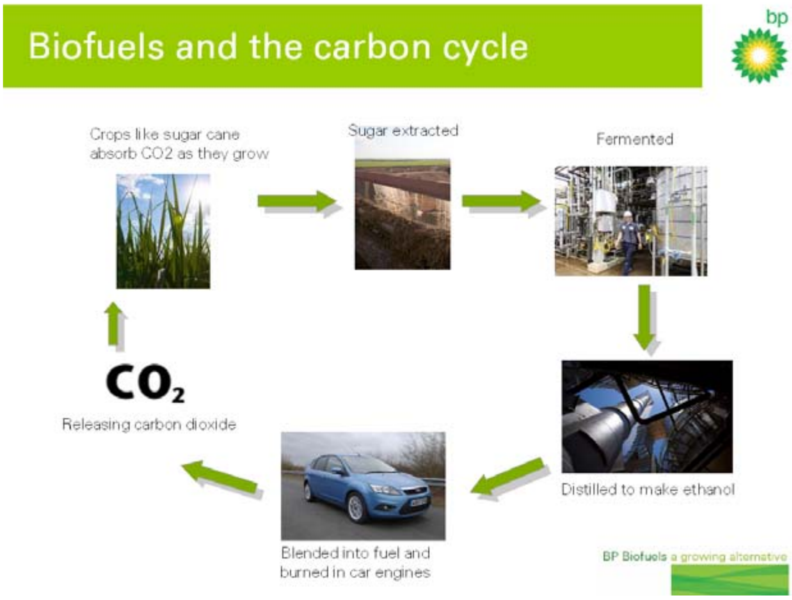
Firstly, what has been behind the move towards biofuels as a component in our fuel?

Secondly, what might the winning biofuel technologies be?

And Finally, are biofuels doing any good?

But, as a preface, just a quick reminder on why Biofuels emit fewer emissions than fossil fuels:

SLIDE 2 – Carbon cycle



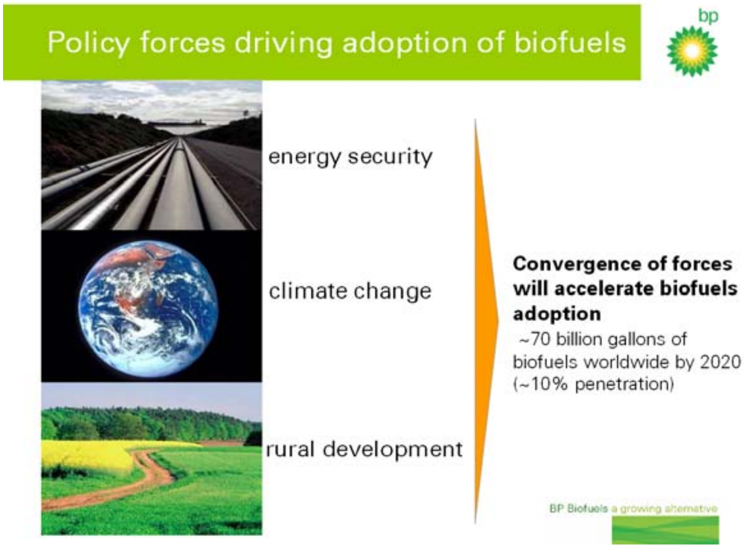
Simplistically, biofuel feedstocks – that is, plants which we call biomass - absorb CO2 from the atmosphere while they are growing. This means that when the biofuel is burned in a car engine the CO2 that is emitted is not fossil CO2 – instead it is the same carbon that the living plant removed from the atmosphere to grow.

There can be some fossil carbon inputs in making biofuels – like energy for fertiliser manufacture, transport fuel and process power. But so long as these inputs are less than the CO2 emitted in making and using conventional fossil fuel, then biofuels deliver net greenhouse gas savings.

Fortunately it is possible to get really good savings with the right biofuel technologies.

So what we are doing is making fuel from carbon recently taken from the atmosphere and captured on the earth's surface in plants by means of photosynthesis, rather than extracting carbon deposited millions of years ago and trapped thousands of feet beneath the surface, and releasing it back into the atmosphere.

SLIDE 3 Why Biofuels



What are the drivers behind the increasing adoption of Biofuels?

There are two big trends: the need to address the risk of climate change, and the drive for greater energy security – particularly for oil - in a world where demand is growing and supply is becoming less straightforward.

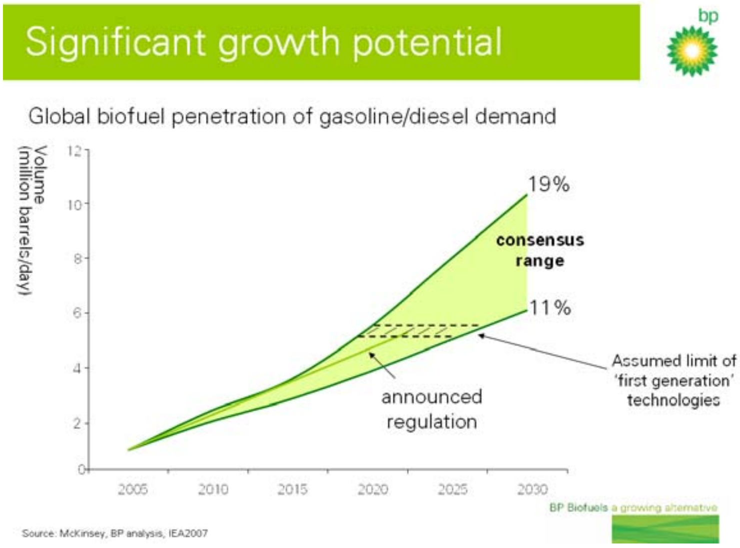
This is particularly apparent in transport fuel: more than 60% of the world's oil goes into transport. More than 90% of the world's transport fuel is made from oil.

Although the transport sector accounts for around 20% of global greenhouse gas emissions it is growing fast – by 2030 the number of passenger cars on the road is expected to double to 1.4bn. And while there are many options for decarbonising power generation – such as nuclear, wind and solar - transport has fewer clubs in the bag

We believe that biofuels are the only viable solution to provide secure, scalable, competitive, low-carbon energy for transport and that when combined with an increasingly efficient vehicle fleet, and sensible demand management steps, a more sustainable future for transport is possible..

And of course the investment in agriculture which is implicit in biofuel production will have a powerful effect on improving rural livelihoods, both in the developing and developed worlds.

SLIDE 4 "Significant growth potential"



This helps explain why regulators have taken to Biofuels with some enthusiasm.

The regulatory frameworks that are currently in place require significant Biofuels growth.

Here in Europe the Renewable Energy Directive requires that 10% of transport fuel will come from renewables by 2020, and biofuels will be most of that.

The US plans to increase the amount of biofuels it uses from last years 9 billion gallons to 36 billion by 2022.

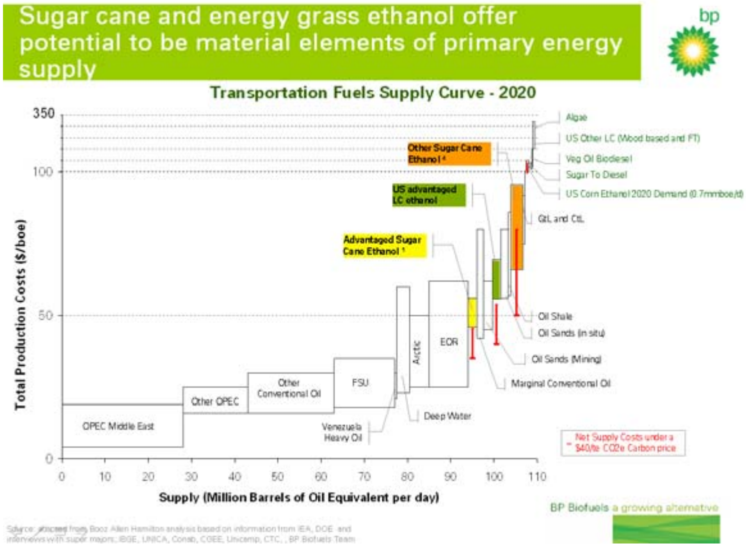
Brazil has already walked this path. More ethanol is now sold there than petrol and 92% of all new Brazilian cars have ‘flex fuel’ engines that can run on any mix of petrol and ethanol.
600 million tonnes of CO_2 have been avoided since the start of the proalcool programme in the 1970s. That’s more than the UK’s total carbon emissions in 2005.

So, regulation has set out a clear growth pathway, and Brazil’s experience shows us that demand-side constraints for biofuels can disappear, given time.

But supply side constraints remain.

What volume of biofuels can be produced sustainably, without unacceptable negative impacts on other resources, like land and water?
And how much can be done at a price point that is competitive with crude, enabling the industry to escape dependence on regulatory support?

SLIDE 5 – Supply curve



Studies have suggested that there is sufficient land and water for Biofuels to meet as much as 30% of road fuels without impacting food security.

The question is whether this can be done at a price that can compete with fossil alternatives. All Biofuels are not the same. They differ widely in fossil carbon mitigation, and cost.

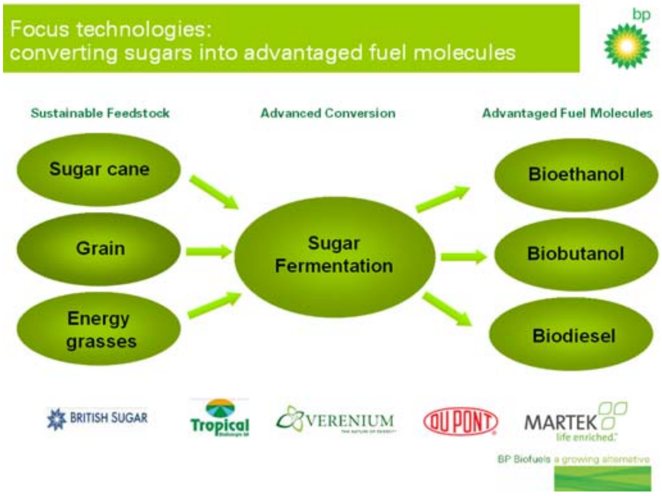
Clearly, the higher the oil price, and the carbon price – the broader will be the range of competitive biofuels, and the greater the supply.

Here we have positioned some of the more competitive biofuel sources against estimates of the cost of supply of various sources of crude – and shown the impact of a carbon price of $40/te.

To be competitive and low carbon requires the right technology, the right feedstocks, and the right locations. In our view, this imposes limits on the growth of the most cost and carbon competitive Biofuels. But even the 6mbd potential we show here - the most competitive capacity of the US and Brazil - represents a five-fold increase in production versus today.

2. Technologies

SLIDE 6 – Biofuel technologies



There are many different technologies for producing Biofuels touted by a diverse range of organisations.

But if you accept that Biofuels need to compete on cost with fossil, need to deliver robust carbon savings, and need to be delivered sustainably, the range of viable technologies narrows.

Today, there are really only three “first generation” technologies – the fermentation of cane sugars (sucrose) and sugars from starches (glucose) into ethanol, which is blended into petrol, and the esterification of vegetable oils into biodiesel.

There is much criticism of first generation biofuels, mainly because we happen to eat the parts of the plants they are made from. Beyond, arguably, the potential for short term, commodity specific, price distortion, this is a false distinction.

All biofuels require the same resources: land water and sun.

The question is what is the availability of these resources and how can we utilise them most efficiently? There are certainly parts of the world where some or all of these resources are constrained. And other places where they are plentiful. Provided we don't deplete scarce resources, the more relevant question is whether the chosen biofuel feedstock is resource efficient, carbon efficient and cost efficient.

For example, you get less than 4000 litres of ethanol from a hectare of corn, growing corn intensively requires lots of fertiliser, the price of corn is set by food markets, not energy markets, and older factories are powered using coal. Ethanol made in this way is going to be relatively expensive – around $90/boe – and will yield only a marginal carbon saving against petrol.

In contrast, another first generation biofuel, Brazilian sugar cane ethanol, has high yields – around 7,500 litres per hectare, can be grown on under-utilized land, and irrigated using only rainwater. Most factories generate electricity using the waste fibres – bagasse – in the boiler. The liquid by-product, vinasse, is sprayed on the field, replacing demand for fertilizer. It is an almost perfect closed-loop system.

Last year, BP made a large investment in Brazilian biofuels and we now have a joint venture there, Tropical BioEnergia that is now operational.

Of the plethora of potential future technologies – photosynthetic algae, gasified biomass, etc, we believe that the technologies most likely to continue to meet our selection criteria are those that involve the conversion of low cost, low carbon, sugars.
Sugar cane will always be competitive.

But something we’re very excited about, that grows in more temperate climates, is energy grass.

These tall grasses are very high yielding. They hold high volumes of sugars locked up in the cell walls of the plant. Accessing these sugars is much more difficult than with cane sugar, but new technologies are being developed to extract the xylose and glucose from the stalk and leaves, enabling virtually the whole plant to be used as feedstock.

BP has a technology partnership with Verenium Corporation in the US who already have a demonstration-scale facility producing lignocellulosic ethanol from these specially grown grasses. This second generation process is very productive – delivering three-to-four times more ethanol from every acre of feedstock than less efficient crops like corn.

As with sugar cane, this means that much less land is needed to grow the fuel crops – reducing costs and carbon.

Diesel is more problematic. Biodiesel is commonly made from vegetable oils – like palm, soy and rapeseed, but not only are these relatively low yielding crops and therefore relatively expensive, they have also been associated most strongly with concerns about deforestation. The challenge has been finding a low cost, more sustainable way of making a biocomponent that will work in a diesel engine.

Production of biodiesel from photosynthetic algae has generated a lot of interest. We are sceptical about the ability of this “phototrophic” technology to reach a commercial scale.

We are looking instead at heterotrophic routes to make biodiesel from sugars. Here we use a conventional fermentation process to feed bugs sugars and convert them to lipids – or fats – which can then be turned into biodiesel. We have recently announced a $10 million investment with Martek Biosciences Corporation to pursue this.

When combined with sustainably grown, low cost lignocellulosic and cane sugars, we believe that this approach has the best chance of success in the medium term, with better economics, integration potential and scaleability.

The next challenge is how to get these biofuels into the fuel supply system. Bioethanol has a number of challenges as a fuel molecule. It attracts water, and can be corrosive, so it cannot be transported through today's fuel infrastructure and can only be used in relatively small blends (10% or less) in unmodified car engines.

You may have heard reference to the blend wall – where the required penetration of biofuels overtakes the capacity of the system – both cars and infrastructure - to take on any more. Estimates suggest that parts of the US could hit the blend wall in 2012.

That's why we are developing, with our partners DuPont, an advantaged biofuel molecule called biobutanol.

Biobutanol gives more miles per gallon than ethanol. It can be blended in higher concentrations than ethanol. And it doesn't mix with water, so we can easily put it into pumps, pipes and refineries.

This means that biobutanol enables more biofuel to be put into the mix earlier. It means that petrol firms will be able to comply with regulation at lower cost. It means that drivers will pay less for their fuel, and need to make fewer refuelling stops.

We have a technology demonstration facility under construction in Hull – alongside our worldscale Vivergo Biofuels plant and we expect this to be producing quantities of biobutanol next year. Commercial production is expected within three years.

So, we believe the winning technologies will be those based on the fermentation of sugars, from biomass, into bioethanol, biobutanol and biodiesel.

As we have seen, Governments, for various reasons, want more Biofuels. The right choice of technology, executed the right way, can deliver low cost and low carbon Biofuels. But many people worry about the broader environmental and social consequences of using the planets agricultural resources to make energy.

SLIDE 7: Press cuttings

Bill Clinton said earlier this year that the world wants and needs biofuels, but not at any price. This is true. Doing biofuels sustainably has become a licence to operate issue.

I see the sustainability concerns falling into two main buckets:
The first are what could be described as displacement effects – most significantly the concern that using corn for fuel displaces supply for food use and so drives up food prices – the "food versus fuel" issue, and the continuation of this argument into the assertion that higher food prices cause agricultural activity to expand into rainforests – the "indirect land use change" – or ILUC – issue, and the claim that this means that the real GHG emissions from Biofuels are much worse than claimed.

The second bucket contains the direct effects of poor agronomic, industrial, or social practice.

The displacement effects concerns boil down to a worry that there simply isn't enough land and fresh water to both feed a growing population and meet the draw from energy.

A while ago I was discussing this with some FAO officials in Africa. They pointed out that the problem was not that there wasn't enough land. The problem was market failure. We believe that there is sufficient land available to meet future food, feed and fuel needs.

In fact, we believe there is additional adequate land to support the production of 30% of liquid road transport fuels as long as the right technologies mature successfully.

Land use for biofuels is estimated today at around 14 million hectares, or around 1% of total cropland. If all major countries and regions are to attain current targets this might rise to around 4.4% of current cropland, or just over 1% of all farmed land including pasture.

Fundamental to this is the potential for yield improvement – from technology innovation and better agricultural practice.

But what studies overlook, and what development economists have highlighted to me, is that investment in Biofuels production – particularly in the developing world – brings infrastructure and jobs to marginalised communities. It enables the creation of local markets and thereby catalyses the transformation of previously unproductive land to the production of food. It removes the need to destroy fragile habitats for subsistence support. It seems to me to be a better way of providing food security than dumping subsidised agricultural surpluses into developing markets. We should recognise the possibilities for food *and* fuel, rather than focus on food *versus* fuel.

And, to illustrate what can be done in terms of good agronomic and conservation practice, our own Brazilian biofuel operation, which is more than 1,000KM from the boundaries of the Amazon, has a nursery of native tree species which are being planted to minimize soil erosion, protect waterways and promote biodiversity.
We've planted 51,000 trees so far and will plant another 25,000 next year.

I've spoken about the "closed loop", where most of the inputs required for the operation are sourced from the by products of the process itself, but in addition, and in common with most modern operations, we have fully mechanised our harvesting. We provide jobs to about 10% of the population of the two closest towns – including providing skilled jobs and training for young women.

But good practice needs to be underpinned by good policy.

What does that mean?

It means incentivising the best biofuels with policies that reward high performance in reducing greenhouse gas emissions rather than using volume mandates that simply encourage more of the same.

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.

Brazil, with its three-decade old ethanol industry, is taking a lead in this area. It recently announced plans to enforce agro-ecological zoning that will regulate the expansion of sugar cane, and help ensure that biodiversity and high-carbon value land is properly protected.

In Europe, the Renewable Energy Directive, incorporates mandatory sustainability targets to ensure that the inclusion of more renewable energy really does reduce carbon emissions.

And industry actors – through nature of their investments, through their operating standards, through the requirements they set when buying Biofuels, and through their investment in new technologies – can build on a framework of sound regulation to secure a sustainable future for Biofuels.

Conclusion

SLIDE : Biofuels done well

The intensive media debate about biofuels continues – and much of it is not based on fact. It is *our* job to be present in the debate and put over a balanced message which highlights the very positive impact of good biofuels – indeed the urgent need for good biofuels.

Because the untold part of the story is not the impact of biofuels, but the impact of *no* biofuels. If biofuels do not achieve their potential, then what happens to the 1.4 billion cars on the road in 2030? Yes, vehicle efficiency will play a significant role. Eventually electric cars may progress, but for now they require more power stations which are largely fuelled by fossil fuels, as well new infrastructure and new battery technology.

Meanwhile the world needs to reduce emissions urgently and around a quarter of them come from transport.

We need a pragmatic lower-carbon solution now. Biofuels offer us a solution to tackle the environmental tyre-print of road transport and we simply have to make them work.

For BP, biofuels are a “renewable well”. It’s not too fanciful to draw parallels with the E+P business we have become expert in the first one hundred year of our existence as a company. In biofuels we need to secure access to resources – sustainable, low cost sugars – and produce “green barrels”.

Perhaps these are reserves that one day will be booked and reported to shareholders as is crude today.

To us, the case for sustainable 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.