



The future of mobility. Global challenges, pragmatic solutions

Speaker: **Iain Conn**

Title: **chief executive, refining and marketing**

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Ladies and gentlemen,

Our world is changing and changing fast.

Some changes can bring optimism to many – such as the Arab Spring – and hopes for a better future.

Other changes seem to bring only worry and uncertainty, for individuals and companies as much as for nations and international relations. It is now clear that although progress was made overnight, the global and European debt crisis will not be resolved by quick or easy solutions. Major structural changes in our economies – many of them necessary to maintain global competitiveness but accelerated by the depth of the crisis – will present great social and political challenges.

All of this has to be accomplished in the context of a fundamental global rebalancing from west to east, driven by massive growth in the Asian and other emerging economies. The need for clear and responsible leadership – from government, financial, business and social leaders – has never been higher.

The world of energy is not immune from these challenges. Energy is fundamental to our lives and its security is vital, but delivering energy is not risk-free. Three things have happened in the last two years which remind us of this, and put pressure on the price of our energy and our mobility.

Firstly, the Arab Spring has taken key North African supplies out of the market, contributing to higher oil prices. Secondly, events in the Gulf of Mexico in summer 2010 reminded that multiple causes, involving multiple parties, can align to produce tragic operational failures, with widespread and globally visible consequences. BP is committed to the environmental and economic restoration of the impacted areas on the Gulf Coast.

We have already paid over \$7 billion in claims and have incurred a cash outlay to date of \$25 billion, including response costs and payments to the Trust Fund we agreed to establish.

Thirdly, in 2011 the consequences of the Japanese earthquake and tsunami have again raised questions and shaken expectations about nuclear power. Many refineries were also affected and Japan has been buying oil products and natural gas from the global markets.

It is important in both of the last two cases to understand precisely what went wrong, to learn and implement the right lessons from these events and to respond in a way that will strengthen and not weaken future energy availability.

Regarding offshore safety, it is encouraging that these principles have been recognised in the legislative proposals adopted this week by the European Commission. With our industry, we will continue to support and play our full part in learning and implementing the lessons from the Gulf of Mexico accident.



All these changes affect energy today but we also need to layer on the continuing rise in demand for energy, which adds to the challenges.

Demand in China, India and other major non-OECD economies is continuing to surge ahead.

China passed the US as the leading CO₂ emitter in 2006 and the leading global energy consumer in 2010. By 2030 Chinese energy demand is expected to nearly double and the non-OECD will account for around two-thirds of all global energy consumption.

So although energy demand in the US and EU is essentially static, the growth of the non-OECD economies will ensure that total global energy demand continues to rise in the decades ahead. This will put pressure on all types of energy sources, with the potential to increase prices as we have seen with iron ore and other commodities.

The fastest growing source of new energy on a global basis (in percentage terms) will be renewables. We expect aggregate renewables use – including bioenergy – to grow five times faster than total energy use and to meet 6 to 7% of global energy demand by 2030.

In other words, the global shift towards renewables is happening and can be expected to continue and even accelerate beyond 2030.

Energy efficiency and the relentless progress of technology will also shape the energy future in ways we cannot necessarily anticipate. But if much changes, much also remains familiar.

Fossil hydrocarbons will continue to supply the major part of global energy demand. Although renewables will grow quickly, by 2030 around 80% of energy supply will still be from coal, natural gas and oil.

Of these sources, flexible, clean, cost effective and lower CO₂-emitting natural gas is likely to be the 'big winner', gaining market share from both coal and oil.

By 2030, nuclear, hydro and renewables will still only account for some 20% of aggregate global energy demand. Oil and biofuels will continue to dominate the mobility sector.

The continuing demand for oil and gas will pull in new sources of supply including from deepwater, shale gas and coal bed methane, heavier oils and remote and Arctic locations. The technical challenges of oil recovery will increase, but the high energy density and transportability will ensure that oil remains competitive in the mobility market well into the future.

A second unchanging factor is that the global demand for mobility will also continue to grow.

As prosperity rises in the Asian and other non-OECD economies, the demand for mobility will grow with it, driven both by individual aspirations and the demands of an increasingly urbanised society.

The figures are startling.

The number of new motor vehicles in China last year exceeded those in the US and the EU by 60% and 20% respectively. IHS CERA estimates that the total number of light duty vehicles in Asia will grow to over 670 million by 2030, about the same as Europe and North America combined.

However, from listening carefully to our OEM partners, we also expect to see continued evolution in the world's car park. For example we should see vehicles evolving from oversized to right sized; the internal combustion engines evolving from overpowered and inefficient to powerful, efficient and downsized; and electric vehicle growth continuing, if we can address the issue of CO₂ intensity and other factors in the electricity supply chain.



The demand for mobility emphasises a third unchanging factor in global energy – the constant challenge to balance sustainability, security and affordability.

All the analysis suggests that the growth in global CO₂ emissions will continue and that declines in European emission will be more than offset by increases elsewhere.

This is not welcome news and we need a sustained global effort to put a serious multilateral CO₂ agreement back on track.

But we also need to recognise that energy policy is not a one dimensional business. Our societies are looking not only for sustainable energy but also for affordable energy and a secure energy supply.

Affordability, security and CO₂ mitigation are also highly important policy objectives and deserve to receive equal weight in energy policy thinking.

Without affordability and security, our economic well-being will decline and our ability to address the CO₂ question in a meaningful way will decline with it.

In industry we know there are numerous possibilities but no silver bullets. As I have said in previous speeches, we need to take pragmatic actions and avoid the temptation to keep 'polishing the 2050 diamond' until we have a theoretically perfect solution. We also look for governments and the European Commission to recognise and balance this triple challenge.

Energy is indispensable to moving people and goods in every form. I have tried so far today to describe some of the context - what is changing and what stays the same – around the future of energy and mobility.

At this point I would like to suggest four key policy messages – the four things we can do now in a practical way to address the energy and mobility challenges. Let me call them the 'four Ps' – not the most original catch line ever but I hope it will get the point across.

The first is the need for pragmatic solutions – the solutions we can deliver in reality that will make a long term difference.

The second is the pressing need for predictable policies – for a consistent policy approach that allows us to get on with the practical business of delivering solutions.

The third is the need to recognise, respect and sometimes to change perceptions – amongst customers, policy makers and the general public, about what works and what is needed for the future.

And the fourth is the need to build partnerships – the ways of working together that will allow us to sustain our industrial capacity and provide competitive global solutions.

Regarding pragmatic solutions my starting point is that the internal combustion engine is far from exhausted and still has much to offer us for the future.

BP has conducted research together with Mahle and Bosch, to further understand emission reductions in internal combustion engines. The findings suggest that downsizing and developing lightweight, high-efficiency engines can provide further major improvements in efficiency and CO₂ emissions – perhaps of 40% or more. A range of advanced engine and vehicle technologies is likely to emerge, including new hybrid engines, cooled exhaust gas re-circulation technology and the introduction of more efficient six to eight speed transmissions.

Other technologies, such as low rolling resistance tyres, low drag brakes and aerodynamic drag reduction, together with more effective traffic management, will also contribute to efficiency improvements.



Of course the development of electric vehicles is also moving quickly. Electric vehicles can offer important local efficiency and local environmental advantages and will increasingly penetrate the vehicle market in Europe and elsewhere.

However, in making public policy choices, other major factors including the CO₂ emissions from electricity production, the cost of battery storage, the need for major electrical infrastructure development and eventually ways to compensate for the loss of the tax revenues provided by conventional fuels, will also need to be taken into account.

In our view these considerations – combined with the efficiency improvements still available – make it very likely that the internal combustion engine will remain the backbone of mobility for a considerable time into the future, while in parallel we develop better and better electric vehicles and address CO₂ intensity and infrastructure provision in the electricity supply chain.

High quality fuels and lubricants are also an integral part of an efficient and lower carbon mobility system.

Over recent years, the quality of road fuels in Europe and elsewhere has improved with the complete removal of lead, the virtual removal of sulphur and lower aromatic levels. These advances have reduced atmospheric levels of pollutants and enabled new technologies for improving the efficiency of the vehicles and reducing the environmental impact of road transport.

The same is true of advanced, high-quality lubricants such as Castrol. We continue to develop new products and advanced low friction lubricants to improve energy efficiency. Lubricants increasingly are becoming a component and not a commodity.

And if high efficiency, lightweight downsized engines become a key part of the future, advanced fuels will again play an important role. We will also need to introduce growing quantities of the right biofuels into the fuel system.

Biofuels have become a contentious subject in Europe (and the US), perhaps because of initial over-promising leading to an almost inevitable sense of disappointment.

We are confident that biofuels can support engine and vehicle efficiency and make a valuable additional contribution to CO₂ mitigation from the vehicle fleet. Battery Electric Vehicles can attain low levels of life cycle CO₂ emissions only if the carbon intensity of the electricity grid is low.

So what does a balanced biofuels agenda look like?

First bio-components should be sourced where they can be grown most effectively. Locations such as southern Brazil – far from the Amazon rain forest – can supply large quantities of sustainable ethanol, for blending into gasoline at a price competitive with conventional crude oil.

Second we are confident that advanced technologies, making use of the ligno-cellulosic components of the plant, can provide a major contribution. By converting high yielding, non-edible sources of cellulosic biomass, technology enables us to unlock much more efficient uses of land.

We are currently developing this technology at the our own Biofuels Global Technology centre in San Diego and at our demonstration plant in Jennings, Louisiana, and we intend to break ground on our first commercial-scale cellulosic ethanol facility next year.

We also see great potential in new fuel components such as biobutanol. This offers a number of advantages – to the refiner, to the blender and distributor, and crucially to the motorist – including a higher energy density than ethanol and better compatibility with today's engines.



We are continuing to invest heavily to move these processes towards commercial production.

Beyond this we expect our investment of around \$500million in fundamental research at the Energy Biosciences Institute in the US to yield further attractive possibilities over time.

BP's investment commitment to biofuels to date is in excess of \$2 bn.

The combination of progress in engine efficiency – including increasing degrees of hybridization – with more energy-rich, more sustainable biofuels, is a compelling and economically advantaged response to the challenges of decarbonising road transport. On this basis we see many good reasons why biofuels can make a sustained contribution over time to lower carbon mobility.

It will not have escaped your attention that I have spoken mainly about the use of bio-ethanol and related components in the gasoline pool.

However, as a result of both technology preferences and fuel taxation policies, the balance of fuel use in Europe has been shifting steadily from gasoline to diesel. The share of diesel in new car registrations in the EU has grown from about 15% in the early 1990's to about 50% in the last few years. As of 2009, 35% of the EU passenger car fleet was comprised of diesel engines.

In fact total demand for gasoline in Europe peaked in 1992 and has since fallen by about a third. Meanwhile diesel sales for on road use have approximately doubled and now account for about 60% of road transport demand by volume.

Furthermore, around one third of all road fuels usage in Europe is now accounted for by the heavy goods sector. This sector continues to grow steadily and the diesel engine is almost irreplaceable for heavy duty use.

This factor alone will ensure that diesel remains a major source of transport energy for decades to come.

Upgrading of diesel capacity requires large refinery investments and tends to lag behind demand. As a result, Europe is structurally long on gasoline and short on diesel, with gasoline looking for export markets and diesel mainly imported from Russia.

Some OEMs believe there is more future in downsized gasoline engines than in diesel, especially taking into account the use of biofuels. In my view, Europeans need to have choice of both.

Meanwhile governments need to decide whether it is wise to export or import and to judge if the long term road fuels imbalance presents more fundamental concerns around security of supply.

Mobility, of course, is not restricted to land travel. Aviation (jet and avgas) and marine fuel, already account for over 10% of global fuel demand. Aviation fuel consumption is expected to grow significantly through to 2030 and beyond, with particularly strong growth in Asian markets.

From a refining perspective, aviation fuel is closely linked to diesel and poses the same challenges of heavy refinery investment.

In addition, global moves to reduce sulphur emissions from marine fuels could hugely increase diesel demand from the shipping sector from as early as 2018.

The scale of these challenges should not be underestimated and time will be needed to prepare for such a transition.



In these circumstances, it is important to consider whether biodiesel can also make a substantial contribution to fuel supply diversity and CO₂ mitigation. The fact is that the pathways for deriving biodiesel components from vegetable oils are inherently more testing than for bioalcohols.

The challenges can include competition for sensitive land resources in tropical areas, competition for both direct and indirect food uses and limits to the quantity of bio-diesel component from the conventional FAME manufacturing process that can be acceptably blended for fuels use.

There is an inherently higher demand for biodiesel than bioethanol components in Europe and the pressures on sustainable sourcing are becoming more and more obvious.

Treatment of vegetable oils in refineries through the Hydrogenated Vegetable Oil (HVO) process would solve the blend quality problem but not the sourcing of sufficient sustainable components.

In our view, these contradictions need to be urgently resolved in a sound public policy framework and I would now like to turn to this subject.

As industry and society, we need a consistent and predictable framework of public policy to allow sound market judgments, stimulate investments and research, and drive pragmatic and deliverable solutions to complex issues.

Energy and fuels are indispensable to mobility but, unfortunately, it has to be said that current fuels policy in Europe is a mess of targets, obligations, penalties and specifications.

The layering of multiple EU obligations with a variety of national and local targets, specifications and taxation, is in danger of making a mockery of a single fuels market and the efficient movement of goods and people across our continent.

And this is in addition to the setting of a Europe-wide carbon price through the Emissions Trading Scheme, which is and should be seen as the fundamental instrument of climate mitigation policy. .

All these complexities are not only inconvenient but represent a real cost to drivers, customers and overall competitiveness.

In Europe the ambiguity between the Renewable Energy Directive (RED) and the Fuel Quality Directive (FQD) is a prime example. Compliance with one Directive does not necessarily ensure compliance with the other. Depending on the availability of sustainable biodiesel components, it may not be possible to comply with either.

Furthermore, although the quantity of renewables in the fuel mix is mandatory, the vehicle manufacturers are not required to approve or encourage the equivalent fuel specifications for use in all vehicles. Instead we have a proliferation of fuel grades, with only voluntary efforts or uncertain fiscal incentives to underpin demand.

This is not a sensible way to regulate the fuels market. We need consistent and predictable regulation in the interests of customers, vehicle manufactures and fuel suppliers alike.

Perceptions are important and do as much as technology or economics to shape outcomes.

Nowhere was this more vividly illustrated than in the costly and inefficient introduction of the E10 gasoline grade into the German fuel markets earlier this year.

Drivers were unsure whether their cars could safely use the E10 grade, while the designation of the lower E5 grade as 'protection' encouraged a perception that the higher grade was less secure. There are many lessons to be learned here on anticipating and addressing public concerns.



Indeed this lesson can be extended into many areas, including the use of nuclear power, the extension of oil and gas activities into deeper waters and more remote areas and the recovery of natural gas from shale and other tight rocks through hydraulic fracturing.

There are other areas where critical perceptions need to be addressed and one of these is the set of perceptions carried in the complex relationships between the EU, US and China. The basics of global energy described earlier, mean that genuine partnership with China is critical to longer-term success, as is trans-Atlantic alignment on energy policy approaches.

Another crucial perception issue concerns electric vehicles, which in reality can only reduce the impact of mobility on the environment if the CO₂ intensity of the electricity grid is low.

And I would add one set of perceptions about an industry very close to home – the refining of crude oils into usable end products such as gasoline, diesel and aviation fuel.

High quality refineries are indispensable to an effective mobility system. We take great pride in our five refineries in Germany and we are committed to the highest standards of safety, efficiency and environmental practice.

We would look for policy makers to recognise and take a similar view of the importance of indigenous refining capacity.

Finally let me say a few words about partnerships.

I have spoken about the context for mobility policy and the need for a consistent and predictable policy framework.

We can also learn from experience in other major locations including the US. Since the introduction of the Clean Air Act and CAFE standards in the mid-1970s, the American auto and fuel industries have worked together to improve vehicle efficiency, through the use of advanced fuels and lubricants that clean and protect engines.

With the adoption of US Renewable Fuel Standards in 2005, the challenge has moved on to the introduction of higher ethanol fuel blends into the gasoline market. Although there are significant issues to be resolved between now and the end of the mandate in 2022, we are confident that we can work together in a stable regulatory environment to provide even cleaner, lower carbon fuels for our consumers.

In Europe the response to the mobility challenge is, in the first instance, a matter for governments and the European institutions. However, other actors such as the vehicle and fuels industries need to play their part.

Indeed I would put it more strongly.

We are at the point where we need a sustained, serious and long term effort at greater partnership and collaboration between the vehicles and fuels sectors and between our two sectors and government.

Mobility cannot be separated into the vehicle and the source of energy but is an integrated system requiring integrated solutions. Advanced engine and vehicle technologies hold much promise for the future but they need consistent, high quality and universally approved fuels and lubricants, to make maximum economic, environmental and social impact.

I am pleased to say that my own company has worked hard to develop strong and productive relationships with major vehicle manufacturers – including Ford and others represented here today. We will continue working on these to make a difference to the future of mobility.



I believe that for real, material fuel, lubricant and engine efficiency gains, energy and OEM partners not only need to share deep insights and technologies, but actually co-engineer solutions together.

And there is also much that could be gained from a stronger and more effective dialogue between our two industries and government, in order to provide robust and sustainable support for the mobility of the future.

In conclusion, mobility is all about moving our lives, businesses and economies. We should be proud to be part of the mobility story.

I certainly am.

There is huge demand for mobility and it will continue. We need to make mobility safe, reliable and available and we need to make it efficient and lower carbon.

Pathways can be created from Pragmatic solutions, enabled by Predictable policies. The pace at which we move along them will be dictated by our ability to build the right Partnerships and ensuring that Perceptions are aligned with what works and what is needed for the future.

For our part we are ready for the challenge.

Thank you for listening.