Lord Browne of Madingley
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[25 minutes]

Title: *Beyond 2013: Clean energy and its future role in the energy mix.*

Ladies and gentlemen, good morning.

It is a great pleasure to be here at Imperial College today.

I am proud to be an Honorary graduate of this great institution, and in 2007, I spoke at another Imperial College centenary, that of the college itself, just months before it became an independent university.

Back then I was driven into the room in an antique motorcar named Boanerges – I am sorry that my entrance this time wasn't as dramatic.

As that motorcar demonstrated, Imperial is renowned not just as a place of academic excellence, but one that has built impressive and creative connections with business and society beyond the university's walls.

Those connections will be critical in tackling the biggest challenges facing society, such as the building of a low-carbon economy.

I want to make four points this morning about clean energy, its future role in the energy mix, and the position of petroleum technology in a period of great change.

First, clean energy will require a transition – not a break – from the past.

Second, engineers and petroleum technology will be critical in catalysing and managing that transition.

Third, government policy must create the right climate for success.

And fourth, collaboration between businesses and universities will drive the innovation and growth needed for a low-carbon future.

[pause]

Let me begin with clean energy and its future role in the energy mix.

Almost twenty years ago, the IPCC published its second report, and it became clear to me that the industry could no longer ignore the issue of climate change.

The debate then was about the science, and we asked Sir John Houghton to come and educate BP. He was co-chairman of the IPCC's scientific assessment group, and brought with him great passion and credibility.

As Karl Popper famously said, all science is provisional. Sir John spoke in the language of probability, which was music to at least some of the ears of BP's scientifically-trained executive. He played a critical role in bringing people round to a new strategic imperative.

There is still a great degree of uncertainty around the science and the modelling of one of the most complex systems in the natural world.

But the practical debate has moved on. The world has accepted the need for a low-carbon future, with all the uncertainties that entails, and discussions are now centred on how we get there.

I think an analogy from engineering is appropriate.

The transition to a low-carbon economy will be the biggest major project ever undertaken by mankind. When it is complete, we will have completely re-engineered the infrastructure which underpins our prosperity and wellbeing.

Any engineer will tell you that it would be foolish to undertake a project of that size and ambition except by breaking it down into manageable chunks

A sustainable, low-carbon economy will therefore be the result of a transition – not a break – from the past.

Our economy was built on fossil fuels, and it will not withstand the damage if we withdraw them too quickly. Ideological opposition to hydrocarbons would be a disastrous basis for policy, but so too would complacency about the scale of the challenge. We need a sensibly managed decline rather than an unthinking abandonment.

That means that clean energy will have to work alongside fossil fuels for many decades into the future.

Natural gas, for example, is often described as a transition fuel, but we would do better to think about it as a destination fuel.

It is a clean technology, emitting half the carbon dioxide of coal when burned to produce electricity.

It is abundant, with proven reserves being sufficient for over 50 years of current consumption,[1] and technically recoverable resources taking us well into the next century.[2]

It is cheap, cheaper on average than coal, nuclear, solar, onshore and offshore wind when used to produce electricity.[3]

And it is the only fuel which can flexibly support intermittent renewables, and which can provide heat to households around the country using existing infrastructure.

As long as question marks hang over nuclear energy, and storage technologies remain in their infancy, it is hard to envisage an energy system without a major role for natural gas.

[1] BP Stat Review, 2012 figures
[2] IEA WEO
[3] All based on BNEF LCOE data for Q2 2013. These are global averages, using an average of the US and European gas input price.

When it comes to oil used for transportation, direct replacement fuels are few and far between. Biofuels, for example, have faced significant environmental and sustainability challenges, and I think their future remains in doubt.

But improvements in engine efficiency, increased use of electric vehicles and the application of liquid and compressed natural gas engines mean that transportation is becoming less and less carbon intensive.

In the United States, the global capital of petrol consumption, new cars have become over 10 per cent more efficient in the past decade. Before the end of this decade, they are expected to become 25 per cent more efficient again.[4]

The rest of the world is seeing similar improvements in vehicle efficiency, as well as an extraordinary increase in the number of natural gas vehicles. There are now almost 3 million of these clean-burning cars on the world's roads, compared to just fifty thousand in 2005.

And if carbon capture and storage becomes feasible on a commercial scale, then even coal can and should remain a core part of our energy system.

A sudden break from centuries of carbon-based development would be disastrous, and possibly counter-productive. Instead, an intelligent transition which incorporates both hydrocarbons and renewable energy will be more reliable, less expensive, and because it has a higher chance of success, more likely to slow carbon dioxide emissions to safe and manageable levels.

This means that Britain's expertise in petroleum technology and related fields will be as important as ever, my second point this morning.

With hydrocarbons forming the backbone of our energy system for the foreseeable future, the development of domestic resources should remain a priority.

Thanks to advances in technology, we have been enormously successful in extending the lifetime of assets in the North Sea, and I expect the basin's operational life to continue well into the future.

[4] Citi research

But despite these successes, Britain is now more reliant on energy imports than at any time since 1975.[5]

The skills and expertise of our engineers will be critical in developing the offshore and onshore oil and gas reserves, including shale gas, which will reduce that import dependency, and which will form the basis of a safe, secure and reliable energy supply for the future.

But petroleum technology will do more than just unlock hydrocarbons. It has an essential role to play in the development of low-carbon technologies.

Take carbon capture and storage which, as Lord Oxburgh explained, could hold the key to a safe, reliable and environmentally sound energy mix.

Many of the components of CCS are not novel technologies. They have been used in the oil and gas industry for years as part of enhanced oil recovery.

Much more research is needed to make CCS feasible across the economy, and Imperial College is at the forefront of that work with its CCS research programme.

I talked earlier about natural gas, and the role it should play in the energy mix of the future.

In my view, our success in preventing damaging levels of man-made climate change will largely depend on our ability to substitute cleaner natural gas for dirtier fossil fuels.

That will only happen if we can find a way to access the world's vast unconventional gas reserves in a safe, environmentally sound and socially acceptable way.

Companies in the US have done this with spectacular success, and the result is the shale gas revolution we are witnessing today.

[5] DECC statistics

But the rest of the world presents a more challenging operational environment.

Fortunately though, in the words of my colleague Lord Darzi, engineers are trained to find technical solutions to human problems. They are trained to reconcile the technical with the social, and the rational with the irrational.

Petroleum engineers trained in Britain have a head start. They are exposed to some of the most stringent safety, regulatory and environmental standards in the world, and they are ideally placed to extend the shale gas revolution beyond the United States.

If successful, and providing that natural gas is used in place of dirtier fossil fuels like coal, those engineers could make perhaps the biggest immediate contribution to global carbon dioxide reduction.

That is evident from the US experience, where emissions of CO2 from the power sector are now at levels last seen in 1997, down 10 per cent from their peak.

In the UK though, emissions from the power sector are currently rising. We have reversed almost two decades of progress, as a greater portion of our electricity is now generated from coal, and a smaller portion from gas, than at any point since 1995.[6]

So whether it's extending the life of our hydrocarbon resources, developing new technologies, or extending the application of existing ones, engineers and petroleum technology will play a crucial part in the transition to a secure and affordable low-carbon future.

That is the opportunity which our industries must seize. But we cannot do it alone. Government policy must create the right environment for success, my third point this afternoon.

That does not mean directing change. When they have tried to pick winners, governments have almost always failed.

[6] DECC data

Instead, it means catalysing change by creating a clear and consistent policy environment.

That gives businesses the confidence to invest in a range of technologies which will form the backbone of our future energy infrastructure.

I have seen first-hand the damage which policy uncertainty can do to investment in the energy sector.

The private equity firm of which I am a partner, Riverstone, is an investor in AES Solar, which has solar energy operations in Spain. The government there has behaved recklessly by imposing retroactive tariff cuts and failing to adhere to the international Energy Charter, creating a climate of uncertainty and doing great damage to Spain's reputation among investors.

In the UK, North Sea operators have experienced at least four major changes to their tax regime in the last decade alone. Arguments about tax rates seem to dominate, but the stability of fiscal regimes is just as important.

I am confident that we will learn the lessons of the past, and that support for renewable energy will be characterised by a greater degree of certainty.

That is the single most important thing that government can do to ease the transition to a low-carbon future.

[pause]

So if the role of government is to set the rules of the game, it is the role of business and universities to respond to these, driving innovation and growth in new industries. This is my final point this morning.

If I may, I speak on behalf of engineering and technology…. Engineers sit at the centre of this process.

They not only bring technical knowledge to the analysis of commercial opportunities, but an understanding of how to manage complicated projects and processes.

This makes engineers the natural bridge between science and commerce – a critical function in the journey to a low-carbon future.

For this reason, it makes sense that businesses take an active interest in the way engineers are educated and trained.

Some of Britain's biggest engineering firms are already contributing to the quality of engineering education in this country through their extensive networks of university partnerships.

But we still need smaller companies to be more involved, particularly in the further education sector where most of Britain's engineering technicians are trained.

With this in mind, the rapid expansion of apprenticeship schemes in recent years is welcome, but the engineering and manufacturing sectors remain under-represented.[7]

Businesses, universities and government must also work together to educate more engineers, and to encourage them to use their skills to become scientists, engineers and technicians once they leave university.

We need 50 per cent more university graduates to go into those sorts of jobs every year if we are to fill the shortfall which this country is likely to face by the end of the decade.

In the 1980s, the oil industry faced a serious shortage of young engineering talent. That was partly down to perceptions of the organisational culture, which was viewed as hierarchical, old fashioned and stale.

And thirty years later, the engineering sector still faces a problem of perception.

Prestigious schemes like the one million pound Queen Elizabeth Prize for Engineering are helping, and are beginning to change young people's attitudes

[7] http://www.apprenticeships.org.uk/news-media/latest-news/article358.aspx

towards what have been male-dominated industries with an unjustified reputation for dirty, low-skilled and poorly-paid work.

I am the Chairman of that prize, and the support we have received from a range of oil, gas and engineering firms has been critical.

But changing perceptions takes time. Businesses, governments, universities and organisations like the Royal Academy of Engineering must continue to work hard to promote a positive image of our profession.

[pause]

Measures like this, and the others I've spoken about this morning, are not just of educational, economic or political importance.

They are a national imperative.

One hundred years ago, this university began to research and teach the technologies which enabled mankind to move beyond subsistence living, and to confound doom-mongers like Malthus, Jevons and the Club of Rome.

We must ensure that today's doom-mongers are also proved wrong.

The work we do now to secure safe, affordable and low-carbon energy will determine our wellbeing, prosperity and way of life over the next one hundred years.

Politicians, academics and businesses all have a part to play in the journey to a low-carbon future.

But that future will be driven by well-resourced, well-trained and well-connected engineers.

Ladies and gentlemen, thank you very much.