

**The Lord Browne of Madingley
 Miliband Lecture at the London School of Economics
 November 13, 2007**

'The Four Beacons'

Introduction

Ladies and Gentlemen, good evening.

I have been asked to speak this evening on the subject, 'the past, present and future of oil' – which is an impossibly broad topic.

With your permission, I'd like to devote my remarks to an even broader subject: the past, present and future of energy.

There is nothing necessary about oil. The only constants when it comes to energy are people's desire for heat, light and mobility. Economics, politics and technology – which are changing constantly – determine the energy options that are chosen by society to serve those ends.

That said, many of my comments this evening will be about oil: because oil has been the world's most important energy commodity in the recent past and remains so in the present.

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During the forty years I have spent in the energy business I have lived through at least three major dislocations – periods of change and uncertainty, when the rules of the game shifted.

- First, there was the rise of OPEC in the 1970s. Those of us in the Seven Sisters had to adapt to a new world of resource nationalism – a world where we were suddenly price takers and our old integrated, hierarchical models no longer made sense. We had no choice but to pack our bags and start exploring back home
- Then, there was the surge of oil from Alaska and the North Sea in the 1980s. OPEC was put on the back foot, its share of world production declining from more than 50 percent in the 1970s to about 30 percent a decade later. This was the beginning of the consumer age; a time of abundant supplies from multiple sources
- Finally, there is the last few years. Strong demand and lack of investment have contributed to OPEC gaining a more powerful position once more.

And what next?

It is always difficult to recognize when times are truly changing, but I believe we are entering another period of energy dislocation today – caused by the

confluence of high fossil fuel prices, growing concern about energy security, fears about climate change and broadening energy choices.

The present energy dislocation is a thoroughly modern event – the product of a world that has become increasingly sophisticated and interlinked, but also more volatile and anarchic.

I am struck both by the magnitude of the changes taking place and by the degree of uncertainty and complexity surrounding us.

I am also struck by the sheer number of new actors now appearing on the energy stage: policymakers from multiple ministries; businesses of every kind; scientists and academics; and the public

It is important to explain what is going on. But I believe we are currently long on analysis and short on recommendations about what to do in response.

I think a nautical metaphor may be appropriate here. We are sailing into unknown and choppy seas. There is a maelstrom of currents, which of course we must try to understand and anticipate. But we also need beacons – fixed points that help us to navigate.

I believe there are four beacons that business leaders should keep in mind when navigating in today's new energy world.

After briefly setting the scene, it is on *these* points that I'd like to focus my remarks this evening.

CHAPTER 1: The Energy Present

But first, the currents that are swirling around us...

There almost as many ways of analysing today's energy world as there are analysts.

My own preferred approach is to look at four trends that have come together in recent years.

- First, high fossil fuel prices;
- Second, increasing fears about energy security
- Third, growing concern about the environment
- And fourth, technology innovation.

Of course these currents are all inter-related, but let me talk to each one individually.

When it comes to fossil fuel prices, I'd like to devote my remarks to oil. That's because the oil price remains the most important driver of energy economics – the benchmark against which many other energy sources are priced.

The price of oil, adjusted for inflation, has averaged about \$60 between 2004 and today. Between the year 2000 to 2004 it was half that figure.

High oil prices result from the coming together of several factors.

On the supply side, we have witnessed limited spare production capacity, caused by years of underinvestment. This has coincided with growing concern over the dependability of key producing nations – which I will talk more about in a few moments.

The fear that supplies could be disrupted has created a so-called risk premium.

At the same time, OPEC is in a disciplined phase and the market believes it would act to restrict supplies if prices were to fall off significantly.

Another, under-appreciated, supply-side factor has been the recent increases in oil production costs. The IHS-CERA Upstream Capital Costs Index indicates that equipment costs have roughly doubled between 2000 and today.

As a result, Goldman Sachs estimates that the marginal 4 million b/d now cost an average of \$70 per barrel to produce.

Of course some of the recent cost increase is the result of cyclical increases in input costs – steel and skilled labour, for example. These pressures could well ease over time.

But there is also a more fundamental cost dynamic at play. The fact is that non-OPEC oil is becoming technically more difficult to produce, as low-cost fields are depleted and increasingly sophisticated technology is deployed to exploit less accessible reserves.

This factor alone implies that long-run marginal costs will stay high and push higher over time – which I believe will place a firm foundation under oil prices for the foreseeable future.

On the demand side, demand for oil has been strong, driven predominantly by the booming Asian economies.

Taking a longer term view, demand is expected to remain robust, underpinned by the anticipated growth in the global population from 6 billion today to 8 billion by 2030, and by continuing global economic development.

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The second trend is rising energy insecurity – which is really a blanket term for three different types of fear.

First, there is the concern that unforeseen events could disrupt oil supplies in the short term.

Second, there is concern that oil production will 'peak' in the foreseeable future.

And third, there are concerns stemming from the geographical concentration of oil and gas resources.

I believe the concerns about supply disruptions and 'Peak Oil' are greatly exaggerated.

The concentration of resources in particular areas however is real.

More than 75 per cent of the world's proved oil reserves are now located in three regions: Africa; Russia and the Caspian; and the Persian Gulf.

And more than 50 per cent of the world's proved natural gas reserves are in just three countries - Russia, Iran and Qatar.

In many of those countries the oil and gas industry is state controlled. Outside investment is restricted, if it is permitted at all.

The politics surrounding resource concentration are increasing.

Some energy-rich countries are using their energy resources as an instrument of foreign policy, reminding customers that they can cut off supplies to extract concessions.

Competition for spoils has also compounded civil unrest in some countries, such as Nigeria and Iraq.

And resource concentration has become closely bound up in broader geo-economic trends, which are further unsettling governments.

For example, petrodollars are being channeled into sovereign wealth funds controlled by oil- and gas-rich states. According to the Peterson Institute for International Economics, funds controlled by countries in the Persian Gulf alone are now worth more than \$1 trillion – possibly much more than that.

Their pursuit of investments in OECD countries is creating friction.

Because of the political concerns associated with resource concentration, governments all over the world are increasingly seeking so-called "self sufficiency" – or, failing that, they are looking to state to state arrangements to secure supplies.

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The third current contributing to today's energy shift is increasing concern about the environment.

Hydrocarbon consumption in rapidly developing countries such as India and China is causing poor air quality and local environmental damage. These nations are now following developed countries by placing increasingly stringent controls on pollution such as SO₂ and NO_x.

Climate change is literally a higher level problem, and one that threatens the entire eco-system.

In the past few years, an overwhelming scientific consensus has emerged that greenhouse gas emissions from fossil fuels and land use changes are having dramatic effects on the world's climate system.

The issue of climate change is 'catching fire', with the public response described by some commentators as the civil rights movement of our generation.

Businesses are now taking action in response to climate change: ranging from supermarkets offsetting their carbon emissions to the huge increase in investment in low-carbon technologies.

National governments are moving from rhetoric to putting in place long-term targets and – over time – fiscal and regulatory policies designed to promote low-carbon technologies and to encourage energy efficiency.

And at the global level the UNFCCC is running talks on a successor to the Kyoto Treaty – with the prospect of a framework that includes global, regional and national emission reduction targets.

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The fourth major trend is technology innovation.

Because of high prices, energy insecurity and environmental concerns, society is increasingly demanding energy that is sourced and delivered differently.

And the brightest and the best – from biology, physics and engineering – are turning their attention to doing just that.

There are now 1,400 renewable energy venture capital funds, for example, which are investing \$8bn per year.

Total investment in renewable energy, which include more-developed technologies such as wind and first generation biofuels, now exceeds \$100bn per year.

As these technologies scale up, their costs come down – meaning they are becoming increasingly economic alternatives.

CHAPTER 2: Swirling Currents

The coincidence of the four currents I've just described explain why we find ourselves in a period of churn and uncertainty today.

Of course, these factors are not independent from one another. In fact, they exist in a relationship of complex *interdependency*.

For example:

- high oil and gas prices are partly being caused by concern about resource concentration; yet energy insecurity is also being heightened by the high oil and gas prices;
- technology innovation is mitigating the cost of both low-carbon and high-carbon energy simultaneously;
- and climate change may result in societal disruptions such as population movements or water shortages, further accentuating security concerns

In a world of complex interdependency there are tradeoffs. That is indeed true of the energy sector today.

Let me give a few examples.

As oil and gas prices have risen, coal has become increasingly economic. It is also viewed favourably from an energy security perspective in key consuming countries such as China, India and the US, because they have abundant indigenous resources. The tradeoff is that coal is also the single biggest source of manmade carbon emissions.

Another example is Britain's 'dash for gas', which has helped lower the UK's emissions profile but has also resulted in far greater vulnerability to foreign gas supplies.

Finally, oil production from the Canadian tar sands is helping reduce North America's dependence on foreign oil. But it is also leaving a dramatic footprint on the local environment

So we are in a world of complex energy tradeoffs.

And, in response, I detect the emergence of a new energy *realpolitik*, epitomized in the title of the recent US National Petroleum Council report, "Facing the Hard Truths about Energy"

Where do the business opportunities lie in such a world?

The first thing to say is that I believe all energy sources – high-carbon and low-carbon – will grow, side-by-side, for a long period of time. That is inevitable given the sheer scale of the increase in future energy demand.

According to the latest IEA World Economic Outlook reference scenario, there will be a 55% increase in global energy demand between now and 2030.

However, as always, the smart money will look to those sectors with the greatest *rate* of growth. And where *these* opportunities lie will depend on the dynamics of the underlying currents I have spoken about.

The challenge is that how the currents will develop, and how they will combine, remains highly uncertain – particularly during today's period of dislocation. They will differ between countries and they will differ over time.

For example, climate change is currently a relatively stronger influence in Europe than the United States, where energy security concerns prevail.

That explains why Europe was the first region to adopt a binding carbon policy and why the Bush administration has focused its efforts on promoting biofuels, rather than on power sector initiatives that would offer greater carbon savings.

However, the picture is changing. Climate change appears to be becoming more important in the United States over time, led by growing public concern and NGO activism. And energy security is rising up the political agenda in Europe, as Russia tightens its grip on regional gas supplies.

Both trends – if indeed they continue – would ultimately result in a changed set of business opportunities.

So if winning participation strategies are not easy to find today, where *do* the real opportunities lie for energy businesses?

CHAPTER 3: The Four Beacons

At this stage in the evolution of the industry I do not believe it is possible to pick winning options. We simply don't know what the winners will be. And guesswork is never a sound basis for business.

But even if the destination is uncertain, I believe we can make progress by following certain principles.

I see this as being akin to navigating a course through rough and uncertain seas. The principles we must follow – and I believe there are four important ones – are like beacons that show us the way.

The first beacon is flexibility: the ability to adapt and to respond quickly to change.

Flexibility is about maintaining a portfolio of options and knowing which to scale up and which to shut down – and when.

Look, for example, at the recent history of the telecoms industry, which has gone through its own period of discontinuity and change. The companies that have prospered were not those that bet on one option – 3G, fibre-optic infrastructure or dot-coms– but those that have maintained a portfolio of options.

There is now a similar need for flexibility in the market for renewable and alternative energy. The suite of options is wide-ranging – wind, solar, hydro, geothermal wave power, conventional biofuels, advanced biofuels, carbon capture and storage and so on.

Today, some of those technologies have a clear advantage. Wind, for example is competitive in several markets where there is favourable weather, strong demand and good transmission systems.

Solar is currently less advantaged. But that could change quickly if there are technological breakthroughs in cell manufacture or thin-film technology, or if high consumer demand for distributed energy leads to greater economies of scale.

Commercial-scale power plants that use carbon capture and storage to eliminate most of their greenhouse gas emissions have been envisaged for years – but as yet they remain on the drawing board.

However if prototypes are built and succeed, this technology could take off. CCS has enormous business potential because it would enable large economies such as the US and China to burn their vast reserves of coal for electricity, without the unsustainable environmental impact that this has today.

So flexibility in energy, as well as in other industries, means understanding future options and investing judiciously. Methodical and dispassionate analysis is required - avoiding prejudice or premature conclusions. This is how we start to assemble an accurate vision of the future – rather than one that is based on the past. Because the past is at best only a rough guide to the future.

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The second beacon I want to talk about is the ability to work in collaborative networks.

Companies do not exist in a hermetically sealed bubble. Their work is connected in multiple ways to that of other actors including governments, NGOs, consumers and the public.

In an increasingly interconnected world, business cannot make progress without understanding these other players and working closely alongside them.

A collaborative approach starts with deeper customer relationships. Leading consumer companies, such as Nintendo and Procter & Gamble, have realized that their customers are also their best product designers.

These companies are involving thousands of customers in researching new product ideas, collating the different experiences of consumers quickly and efficiently using modern communication technology and harnessing what is sometimes known as ‘the wisdom of the crowd’.

As businesses become ever larger and more international, they are increasingly coming into contact with some of the world’s most challenging issues. Climate change, poverty, human rights abuses, the depletion of natural resources.

The smart companies have realized two things. First, they cannot ignore such issues. And second, they cannot respond alone. They do not have the expertise, the contacts or the credentials.

And so over the last two decades we have seen a remarkable growth in co-operation between businesses, governments and NGOs to confront some of these issues.

To give just two examples...the Forestry Stewardship Council is ensuring that timber sold commercially comes from sustainable sources. And the Equator Principles are ensuring that large, project-financed construction projects in developing countries meet high environmental and social standards.

The oil industry is seeing old relationships being recast.

In the early days, the relationships formed between resource holding governments and western oil companies had a colonial air to them. The dynamics of that relationship changed radically in the 1970s when governments took control of their resources and national oil companies emerged.

Today, those national energy companies are extremely significant players. And differences have emerged between them. Some act as if they were the energy arm of the government; others act more independently. We just need to compare the role of Gazprom with the approach of Petrobras in Brazil as it seeks to export its biofuels capabilities internationally.

Relationships between IOCs and NOCs will differ over *time* too, as energy markets, politics, technologies, and the landscape of project opportunities evolve.

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The third beacon is energy efficiency.

I believe efficiency's starring role in our energy future is the only really certain bet we can make.

It is certain because energy security sits at the intersection of all the currents I've talked about. It reduces costs. It allays insecurity. It addresses climate change. And it flows from technology innovation.

I believe every business needs to put in place an energy efficiency plan covering all its activities: operations, supply chains and workforce behaviours.

European airlines provide a good example of such an approach. The airline industry estimates it has improved its fuel efficiency by 70% over the past 40 years via more direct routings, more efficient taxiing on the ground and less idle time queuing for takeoff slots.

The delivery of electrical power is another business where there can be major benefits from a holistic approach to energy efficiency.

A good example is net metering: a mechanism for encouraging electricity consumers to invest in generation such as solar panels or wind turbines which can feed excess power to the grid. Customers who take advantage of net metering have an electricity meter which runs backwards when they are generating more power than they need, generating an instant refund.

Another example is smart grids, which have the potential to revolutionise electricity distribution. Such grids are able to deal with variable, dispersed inputs and to route electricity more efficiently, leading to fewer idle or wasted generators.

Novel approaches are also called for. For example, the US utility Duke Energy is proposing what it calls the "save a watt model" which would allow power companies, working closely with regulators, to earn the same amount for saving a watt of electricity as they would for generating a watt.

Perhaps the biggest energy efficiency challenge, however, is on the side of the consumer rather than the producer.

Changing consumer behaviour is proving difficult and will require a combination of creative incentives as well as regulations.

For example, the Energy Savings Trust estimates that eight per cent of UK households' energy, contributing four million tonnes of CO₂ annually, is wasted by appliances left on standby. Simple technology fixes such as flashing LEDs, or a timer that turns appliances off after a certain period of time lying idle, would make a big difference.

Public education will also be critical, such as establishing a clear link in people's minds behind the electricity supplies they use at home and the large, polluting power stations upstream.

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The fourth and final beacon I'd like to talk about today is what I call 'making carbon mainstream'

I believe it is now virtually certain that carbon will become a mainstream economic cost for business in the coming years and, increasingly, a basis on which management performance – across all sectors – will be judged.

In my view, businesses need to start planning for carbon now. To assume there will be no carbon price is to base one's view of the future on the past and to indulge in linear thinking.

The reason for my confidence is the global momentum building behind carbon pricing policies.

- The EU has already enacted the world's first international carbon cap and trade scheme.
- A growing number of American states, along with Australia and New Zealand, are currently designing their own carbon measures
- The US Congress is actively debating federal carbon legislation
- And the Chinese government has signalled its intent to cut carbon emissions by 10% in the next five years.

There is now the prospect of a global agreement to succeed the Kyoto Treaty, with strengthened carbon measures likely to take centre stage.

At the same time, increased public awareness and NGO activity is encouraging businesses across multiple sectors to report on their carbon footprint and, increasingly, to offset their emissions. According to Trucost, 140 FTSE 250 companies now publish estimates of their emissions as part of their reporting.

So, given this growing momentum, I believe all businesses need to consider carbon as an emerging economic parameter – just as any sensible business factors assumptions about future exchange rate into their plans.

Of course the journey will not be linear. Both the timings and the means by which carbon pricing develops – first nationally, then regionally, then internationally – will remain highly uncertain. Significant business risks will result, especially for energy-intensive industries, and these must be managed.

I believe the critical path – and the source of greatest uncertainty – will be political.

The fact is that, without compensatory measures, the costs of pricing carbon will hit some groups disproportionately:

- Carbon-intensive industries
- Lower-income people, who suffer from fuel poverty
- And countries with a less efficient industrial base or who have a high-carbon generation profile

On the flipside, other groups – such as investors in low-carbon technologies – will benefit.

The thorny political-economic issue of ‘who pays?’ will therefore be central to climate change efforts.

The current energy bill debate in the United States provides a good analogy. A stalemate appears to have set in as various interest groups fight over how the burden of providing a public good – in this case reducing dependence on fossil fuels – should be shared between them.

Putting in place the kind of aggressive carbon legislation that is needed will require acts of real political leadership: putting society as a whole above sectional politics.

Of course this is especially difficult in strongly representative democracies, where institutions are deliberately designed to create checks and balances.

It will be even more difficult in the international arena – where the same political dynamics are likely occur, but between countries – because the international system is even more fragmented and anarchic.

That’s why I believe the world needs to create an international climate agency, modeled along similar lines to the World Trade Organisation, with the authority and credibility to manage carbon abatement activity and the emergence of a global carbon price.

Conclusion

To conclude, we are living through a period of energy dislocation – in a world of diverse energy actors and of complex, interdependent trends.

The challenge is that there are so many different ways to look at what is happening. And each analytical framework seems to urge a different course of action.

I believe the answer is not to fixate on the causes and character of today’s energy maelstrom. Nor is it to try to pick winners. I believe the best approach is to look to *principles* – beacons that will help business to navigate. I have identified four such principles this evening.

Ladies and Gentlemen, it is easy to be laid low by the current headlines.

But I remain optimistic.

With the right political leadership, I believe that energy – and especially the issue of climate change – could be *the* great cause of our time – a cause that brings people together and galvanizes countries to act as one.

We must not let this opportunity slip away.

I'd like to finish with one of my favorite quotations.

Speaking at the end of 1862, Abraham Lincoln said the following: "the dogmas of the quiet past are inadequate to the stormy present. We must think anew and act anew. We must dis-enthral ourselves."

Thank you very much.