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Getting Energy Right

Introduction

It is a great honour and privilege to be invited back to speak at the institution where I studied almost twenty five years ago.

1988 seems a very long time ago.

Ronald Reagan was the US President. It was the era of Perestroika in the Soviet Union. The Cold War was coming to an end.

However, if a week is a long time in politics, a quarter of a century is a short time in energy.

It can take up to 20 years from the issue of an exploration licence for a gas field to the first consignment.

A plan for a power station can take up to a decade to meet regulatory requirements and the resulting plant can operate for 50 years.

A technology research programme will often only see the fruits of its labour several decades after its inception. The current boom in

shale gas seen here in the US has roots that go back decades – including a joint public-private R&D programme in the 1970s.

Change comes slowly in energy – but when it comes it is profound.

When I arrived at Fletcher, the world's population had just passed five billion. Today we share the planet with two billion more inhabitants. In that same time span, the world's consumption of primary energy has risen by over 50%. Millions have escaped energy poverty. But as always, there is more to do.

BP has changed too.

In 1988 we had recently been privatised and had a smaller geographic footprint. Since then, we have grown through a series of mergers to become a truly global company – a so-called super-major - with activities in over 80 countries. We have learned from experience, including the Gulf of Mexico tragedy in 2010. We have refocused our business to concentrate on our distinctive strengths. These range from using the latest seismic technologies to find oil and gas through to world class downstream activities such as leading petrochemical manufacturing processes. We specialize in maximising production from giant fields, operating in deepwater and managing large gas supply chains. All these strengths are underpinned by advanced technology and a century of experience in building relationships. Our strategy is to focus on those strengths to become

an ever safer and stronger company – one that is capable of delivering energy for generations.

More widely, our objective as an industry – and as a civilization, I would suggest – is to enable people to enjoy affordable and sustainable energy now and into the future.

Energy is essential to the most basic aspects of development. The energy industry brings heat, light and mobility to the world – the scooters that take people to work, the lights that enable homework to be done, the refrigerators that hold a village's stocks of medicine. So while we must not shy away from the impacts of what we do, neither should we forget that energy has been central to development – and still is.

And in my view getting energy right means we must address three big issues – issues that mattered a lot in 1988 and matter even more today:

- First, sufficiency – is there enough energy to go round? If there is, is it affordable?
- Second, security – can we rely on our energy supplies?
- Third, sustainability - can we use energy for our needs without an unacceptable impact on the planet?

Sufficiency was a major concern throughout the latter half of the 20th century. Back in the 1950s, the geologist M. King Hubbert had predicted that US oil production would peak in 1970 and he had gone on to predict that the world's production of oil would peak in 1995.

That focused plenty of minds. In fact, and I will, come on to this, things turned out very differently.

The second issue, that of energy security, informed economic and foreign policy in many countries. The Cold War had started to end but the oil price shocks of the 1970s were recent memories – days when crude prices rose 1000% to \$100 a barrel (in today's money) and queues formed at gas stations.

Prices subsequently fell dramatically with the collapse of the OPEC administered oil pricing system in 1985; we witnessed the emergence of an international spot market for crude oil and the removal of price controls for gasoline here in the US.

When I arrived at Fletcher in the mid-80s, oil was less than \$30 a barrel – at one point it dropped to \$10.

Today it is back over \$100 a barrel.

Energy security has remained a hot topic throughout, with an increasing consensus that it depends on having a diversity of sources

of supply – what many in the US call an ‘all of the above’ energy strategy.

The third issue is sustainability.

In 1988, serious questions were also beginning to be asked about the sustainability of energy as climate experts presented projections on global warming to the US senate hearings held in that year. And this issue remains central to the debate on the future of energy.

When today we ask the question: How do we get energy right? We are really looking to find solutions to those same three issues. Availability, security and sustainability: they are as relevant today as they were in 1988.

In the rest of my remarks I want to look at three things:

- how the future of energy is shaping up – with these three issues in mind
- how the US energy industry has come to terms with all three issues in recent years,
- and the prospects for the world as a whole in getting energy right in the coming decades.

Projecting the Future

Let me start with the global energy future.

John F Kennedy said: "Change is the law of life. And those who look only to the past or present are certain to miss the future."

Each year at BP we produce reports which look both ways.

The BP Statistical Review looks to the past to document the previous year's data while the BP Energy Outlook 2030 provides a series of forward projections based on current and expected trends of demand, supply, policy and technology. This is our contribution to "not missing the future."

In the Outlook, we estimate that global energy demand is likely to grow by about 35% between now and 2030 with emerging economies like China and India likely to account for almost all that growth - over 90 per cent of it.

The latest data shows that in 2011, oil made up 33% of the world's commercial energy consumption, with coal at 30%, natural gas at 24%, hydro-electricity at 6%, nuclear at 5% and renewables at 2%.

Going forward, gas is expected to be the fastest growing fossil fuel, at around two per cent annually. It is clean, affordable and increasingly available.

We believe oil will grow more slowly, at around 0.8 per cent per year. But that still means the world will need around 16 million

barrels a day more in 2030 than today – or more than the current production of all of North America.

And we expect coal to grow by around 2.4% a year this decade, slowing dramatically to 0.5% after 2020.

Non-fossil energy – nuclear, hydro, biofuels and other renewables – will grow faster as group than any fossil fuel. But they start from a very low base.

The net effect we believe is that oil, coal and gas are each expected to account for around 26 to 28% of total energy consumption by 2030. This happens as gas competes more strongly in power generation and oil continues to act as an essential transport fuel.

A similar pattern of convergence is taking place among the three types of non-fossil fuel - nuclear, hydro and renewables – which are each expected to have shares of around 6 to 7% by 2030 – the big rise coming from renewables other than hydro – wind, biofuels, solar and geothermal.

Technology is playing a key role on the demand side, facilitating many advances in efficiency: from advanced car engines and better insulated buildings to more streamlined industrial processes and electricity load management.

This is helping to reduce the world's energy intensity – the amount of energy required for one unit of GDP. It came down around 20% in the last two decades and we expect it to come down a further 30% by 2030.

To put it another way, in 1988, 196 tonnes of oil equivalent were consumed for every million dollars of wealth generated. In 2010 that figure had come down to around 150 tonnes and by 2030 we expect it to be close to 100.

As well as this fall in the energy intensity of GDP, there is also a decline in the carbon intensity of energy – the amount of CO₂ emitted for each tonne of oil equivalent of energy that is used. However, there has been less progress in decoupling the growth of CO₂ emissions from the growth of energy use than there has been in decoupling the growth of energy use from the growth of GDP.

Since 1988, the amount of CO₂ produced for each tonne of energy used has fallen only slightly - from 2.6 to 2.5 tonnes - and it is expected to fall to 2.3 tonnes by 2030.

We recognise more action is needed. As we always say, this outlook is a projection, not a proposition. And indeed BP supports additional measures being taken to limit carbon emissions including a widely applied carbon price.

Turning to supply, thanks to new frontiers such as shale and the deepwater, our industry is now producing an enormous amount of previously untapped oil and gas. Again, technology is critical – from hydraulic fracturing in shale formations and the latest techniques for enhanced oil recovery to advances in processing heavy oil and biofuels.

At current consumption rates, the world has over 50 years' worth of proved oil reserves and over 60 years' worth of proved gas reserves in place. Unproven oil and gas resources constitute a much larger potential source of fossil energy.

So the 1995 peak never came. Instead we are working in a world with ever more diverse sources of supply. And diversity, of course, increases energy security.

However, these supplies may be plentiful – and they may be diverse – but they are also in places that are hard-to-get at: shale oil and gas, tight oil and gas, heavy oil, the deepwater and so on.

And typically some of the biggest issues are often not below ground in the geology, but above it - factors such as fiscal regimes, geopolitical tensions, regulatory requirements and land ownership considerations.

The US Experience

And this is where the US experience is instructive. Many lessons have been learned here over the past 25 years – and the US is poised to reap considerable benefits.

US demand for oil peaked in 2005 – partly due to the economic slowdown but also due to the rapid advances in energy efficiency that have been achieved here.

And carbon emissions are falling here too, partly to do with lighter vehicles, partly economic activity, partly power generators switching from coal to gas.

On the supply side, Hubbert was wrong about the world and ultimately wrong about America too because its long run decline in production post-1970 has been halted and production is rising again; this time propelled not by conventional oil such as that traditionally produced across the US but by unconventional shale oil and gas.

US oil production has risen from 6.7 million barrels a day in 2008 to 7.8 million today. Gas production has risen from 511 billion cubic metres in 2005 to 651 billion cubic metres now. While there are ten countries with larger reserves of oil and gas combined, the US is the world's number two in terms of production of oil and gas, behind Russia but ahead of Saudi Arabia.

The net effect is dramatic. Demand is falling, supply is rising and America is headed for self-sufficiency in energy by 2030.

It is a far cry from 1988.

As well as shale, deepwater Gulf of Mexico exploration and production scarcely existed 15 years ago. Today, it provides about 18 per cent of US daily oil production.

This is not just an energy phenomenon but an economic one. Natural gas prices are currently 70% lower than their peak in 2008. This is attracting manufacturing capacity back to the US.

Energy is the number one job-creating sector in the US economy, with oil and gas employment rising a remarkable 27 per cent since 2008.

Energy-related jobs are being created beyond traditional energy regions in 'Rust Belt' states like Pennsylvania and Ohio. BP has just started exploration in Ohio for example.

Oil and gas taxes are pouring into the Government's coffers. This sector is turning round America's balance of trade, helping it compete with China, and breathing new life into its economy.

Why is this happening?

As I mentioned earlier, the resources below ground are a prerequisite, but favourable conditions above the ground are essential. I would sum those conditions up as being a culture of enterprise in the private sector and an enterprise-friendly public sector.

And America has such conditions to a unique degree.

In the land of Apple, Yahoo, Google, Microsoft, Ford, Wal-Mart and countless small businesses, it goes without saying that the culture of enterprise is alive and well. In our own sector, America also has a vast oil and gas industry infrastructure – which by the way is itself a high tech sector. For example, in Houston we are building one of the world's most powerful supercomputers to process seismic data.

In such a culture, we find a cycle of progress occurring. Competition drives innovation and investment, which in turn drive increased supply which makes energy more affordable. Meanwhile, similar forces act to deliver more efficient solutions, which help make energy more sustainable.

But there is also a distinctively enterprise-friendly public sector at work – which is not simply one administration's policy choices, but a culture of supporting people's efforts to build businesses and achieve their goals, going right back to the Constitution.

For example, almost uniquely among the nations of the world, the US allows private citizens to own the mineral rights beneath their property which incentivizes entrepreneurs to compete with each other to access the wealth that lies underground.

This country has a huge advantage in understanding its native geology because of the hundreds of thousands of wells that have been drilled over more than 100 years. State geological surveys have required companies to submit geological records. As a result, the United States has an unmatched geological record.

It is no surprise that the world-changing technologies that have come online over the last two decades were developed or advanced in the US – from horizontal drilling and hydraulic fracturing to deepwater equipment and of course the 3D and 4D seismic that we and others have used to great effect.

America's culture of enterprise and its enterprise friendly public sector have underpinned an extraordinary revolution.

Getting Energy Right Globally

Finally, let me broaden the canvas and ask if this experience can be replicated on the world stage. And naturally my view is that the answer depends on whether other countries can build a similar culture of enterprise and enterprise-friendly public sector.

And bearing in mind what I said at the start, even if countries make major changes now to institute the right conditions, then those changes will take decades to filter through to innovation, investment and production.

China - the world's biggest energy consumer - is making major efforts towards sufficiency, security and sustainability: all the ingredients for getting energy right.

Just last week, it was announced that China overtook the US to become the world's biggest oil importer last December. Hence, China is investing heavily in exploration for oil and gas. Indeed, BP is exploring in the South China Sea, as we are in locations from Brazil to Angola to Australia and many others worldwide.

China also has aggressive targets to substitute natural gas for coal and it has launched a massive programme to explore for shale gas. Russia is the world's top producer and reserve holder of oil and gas. We see this first hand because we have been working in Russia for many years and we are in the process of a deal in which we will take a near one-fifth share in Rosneft. I think the scope for oil and gas development there is extraordinary.

In each country's case, companies need to work with governments to arrive at fair and mutually beneficial solutions. And these are not

always simple. Countries are at very different stages in their energy journeys.

Take two countries – the one we are in now - and the one I come from, India.

In both the US and India natural gas prices are currently low. Good news for consumers. Natural gas is a key part of getting energy right. It is plentiful. It helps countries attain energy security. And it is a cleaner alternative to coal.

However, the low level of prices in the two countries arises from very different factors. In the US, open competition and liberalised prices have encouraged investment. Investment has ramped up supply and increasing supply has driven prices down. Rigs are now being shifted from gas to shale oil production and if gas supply shrinks again the price will rise, encouraging fresh investment. The market regulates the sector to the mutual benefit of consumers, government and operators.

In India, by contrast, the prices have been held down by regulation, from the laudable motive of enabling people to access energy – but with the unintended consequence of discouraging investment so that gas needs to be imported and the subsidies that keep prices low effectively reward exporters in Australia and Qatar.

However, there are now encouraging signs. India is considering proposals to move - as China has already done - towards market pricing - moves supported by many including the Indian Prime Minister.

Conclusion

Getting energy right is a question of sufficiency, security and sustainability.

It was so in 1988 and it remains so today.

Energy tends to exhibit these three characteristics when the right conditions exist – a culture of enterprise and an enterprise-friendly public sector.

Those conditions exist in spades here in the US and they have led to a remarkable turnaround – with a rapid increase in energy production that is now feeding through into economic benefits.

The challenge for other countries is whether they can create or extend similar cultures of enterprise.

I end on this observation.

It took a while for the world to wake up to the American energy revolution and it will take a while longer for the drivers behind it to be understood.

But when they are, I think there will be a global surge to replicate the culture of enterprise that distinguishes this country.

That can only be a good thing.

It will be good for our industry.

More important, it will be good for national economies and the global economy.

And most important – whether we are talking about sophisticated and affluent graduates or the villagers striving to improve their lot in the developing world – it will be good for progress of society as a whole.

Thank you.