Fuelling the future: the road ahead

University College London
London, UK

John Abbott
Downstream Director, Royal Dutch Shell plc
December 8, 2016
John Abbott became Downstream Director and a member of the Executive Committee of Royal Dutch Shell plc on October 1, 2013.

He joined Shell in 1981 after graduating from Birmingham University, UK, with a first-class honours degree in Chemical Engineering.

John has since worked in the UK, Singapore, Thailand, the Netherlands, Canada, and the USA, predominantly in the areas of Global Manufacturing and Supply, Trading and Distribution. In 1994, he was seconded to the British Government on a brief assignment to work in the Central Policy and Planning Unit of the Department of the Environment.

In 2006, John was appointed Vice President Manufacturing Excellence and Support, based in Houston, USA. In this role, he led the development and implementation of processes, standards and improvement initiatives across Shell’s global manufacturing portfolio. In 2008, he became Executive Vice President of Shell’s Upstream Americas Heavy Oil business, based in Calgary, Canada.

In 2012, John was appointed Executive Vice President of Global Manufacturing. Working out of Houston, USA, he led a team of some 30,000 employees and contractors based at around 30 refineries and chemical sites worldwide.

John is a Fellow member of the Institution of Chemical Engineers, as well as a chartered engineer and chartered scientist.
Providing much more energy to more people with far lower emissions is achievable, argues John Abbott. Ultimately, it comes down to the choices consumers, governments and energy companies make. In this speech, John runs through the choices and efforts Shell is making to find solutions to the challenges in the transport sector of transitioning to a low-carbon future.

Ladies and gentlemen, good evening. It is a pleasure to be here with you all.

Haiying Tang works as a cashier at one of Shell’s retail sites in Guangzhou, southeast China. She is kind, enthusiastic and patient.

A few years ago, a man came into the store one night to pay for petrol. Haiying saw that he was exhausted and it would be dangerous for him to continue driving. She offered him a seat in the staff room and gave him a glass of water.

From that point on, the driver came to the station to refuel more often. They got to know each other, became friends and fell in love. They’re now married and have a baby girl.

Now I can’t promise you a marriage proposal the next time you set foot in one of Shell’s retail stations. But I can promise you that Shell – through the actions of employees like Haiying – does recognise the importance of having a strong relationship with customers.

We’ve got to. After all, we want our customers to keep coming back to buy fuel and other products. But that’s not the only reason.

We also recognise that the decisions made by customers will have a big impact on the evolution of the world’s energy system.

If we want to be a part of that future system, we’ve got to listen to their needs and expectations.

What form of transport will people choose in the future? How will they power it? Where will they go to find their fuel of choice?

Will they own cars? Or will car-sharing be the norm? Will they even drive? Or will they prefer to use self-driving vehicles? How many wheels will it have? Will it even have wheels?

What about cost? Will consumers in the near-term be prepared to pay a premium price for efficient, clean cars?

How about where they choose to live? Will they live in the countryside as self-driving vehicles make the daily commute more productive? Or are they drawn to big cities and the convenience of being able to walk to shops and schools?

Shifting regulatory environment
I now want to say a few words on the shifting regulatory environment.

Of course, consumers aren’t the only ones who will influence the shifting global energy landscape. Policymakers also play a fundamental part.

Here in the UK, the government introduced a carbon price floor of £18 per tonne in April last year. This contributed to gas demand in the power sector shooting up by 56% and coal-fired power generation dropping by 73% in the first half of 2016, according to analysis from Aurora Energy Research.

As gas – the cleanest-burning hydrocarbon – emits half the carbon dioxide that coal does when burnt for electricity, emissions from the power sector in the UK decreased by 24% in the first six months of this year.

Policy changes also have a big impact when they’re coupled with a desire from energy consumers.
Look at China. A combination of subsidies plus an appetite from customers for affordable cars led to 330,000 sales of electric vehicles in 2015 – a fourfold increase on the previous year.

Choice determines destiny
It’s important for energy companies like Shell to pay close attention to the decisions made by consumers and policymakers.

It’s also important for companies to make their own choices on the role they want to play in the evolving and expanding global energy system.

As Aristotle said: choice, not chance, determines your destiny.

For its part, Shell is choosing to adapt, innovate and play its part in the global drive to provide more and cleaner energy for all in a sustainable future.

How are we going about doing that?

Within the transport sector, we’re focused on improving existing fuels and vehicles. We’re looking at new fuels. And we’re embracing the development of digital technology.

More on these three points shortly. But first, I want to take a step back and reflect on the driving forces behind the world’s future energy system.

More and cleaner energy
As you’re aware, global demand for energy is increasing. The International Energy Agency, or IEA, expects demand to grow by 30% between 2015 and 2040.

At the same time, a transition to a low-carbon energy future needs to take place to avoid the more serious effects of climate change, from droughts to floods.

This is an unprecedented challenge. But the transition to a low-carbon future, while meeting the world’s growing appetite for energy, is an achievable ambition.

Here’s what needs to happen.

Plotting a pathway
A clear first step is boosting energy efficiency. Much greater efforts must be taken on this front.

On top of this, a transformation of the global economy is required in the power sector, transport, buildings and industry. A significant proportion of energy-related emissions of CO2 occur in these sectors.

Shifts in the consumption of energy within these sectors will drive changes in energy supply.

It’s worth stressing that the pace of change of this transition will vary country by country and sector by sector.

Why? Because wind and solar chiefly produce electricity, which only meets 18% of global energy demand today. For renewables to have a bigger impact on reducing emissions, electricity has to play a large part in other key sectors of the economy.

The switch to using more electricity powered by low-carbon or renewable energy sources will be relatively straightforward for some parts of the economy. Think of the manufacture of food and clothes, which require relatively low-temperature processes and mechanical activities that can be powered by electricity.

But that’s not enough for other parts of the economy, such as industries that produce iron, steel, cement, plastic and chemicals. They rely on hydrocarbons to provide extremely high temperatures, chemical reactions or dense energy storage. Many of these processes cannot be electrified at all, or if they can, not at a reasonable cost.

Transport evolution
What about the transport sector, which accounts for more than one quarter of the world’s total energy use and one fifth of global energy-related CO2 emissions?
Just like other parts of the global economy, the transport sector will demand more and more energy in the years ahead.

There are roughly 1 billion passenger vehicles on the world’s roads today. By 2040, the IEA expects this number to reach around 2 billion.

And consumers increasingly rely on transport to deliver the products they need for their lives.

On its busiest day in 2015, the world’s largest package delivery company delivered 36 million packages. That’s more than twice the number the company delivered just 10 years earlier.

Just like other sectors of the global economy, some parts of the transport mix will be easier to electrify than others.

Today, liquid fuels power more than 90% of the global transport fleet. This number will change as passenger road travel relies more and more on batteries and hydrogen.

But for the foreseeable future, longer-distance heavy-duty road transport, freight shipping and aviation will continue to depend largely on energy dense liquid fuels, including oil, biofuels and liquefied natural gas.

Last month, I visited a Shell retail site on the outskirts of Bangkok. This site is powered by solar panels. As I stood outside with the sun beating down on me, I watched trucks come to refuel. This scene epitomises the energy transition.

A renewable source of energy is being harnessed – in this instance to power the retail site. At the same time, liquid hydrocarbon fuels are being used to power trucks, which can’t rely on batteries at the moment.

**Existing vehicles and fuels**

I’ll now turn to the choices and efforts Shell is making to find solutions to the challenges in the transport sector of transitioning to a low-carbon future.

First up, existing vehicles and fuels.

At the moment, 0.13% of global passenger vehicles are electric. There’s no doubt that electric cars are an important and growing part of the transport mix. In its main scenario, the IEA expects the number of electric cars on the roads to exceed 150 million in 2040.

But given the scale of the system, even with massive growth in electric cars, we believe the majority of vehicles will continue to be powered by internal combustion engines over the next couple of decades.

Every effort must be made to boost the efficiency of these vehicles, thereby cutting emissions.

As I flagged earlier, efficiency savings are essential to a low-carbon future. In its pathway to a future in which the global rise in temperature is limited to 2oC, the IEA expects energy efficiency to contribute nearly 40% of global emissions reductions to 2050.

I discussed energy efficiency earlier this year at a meeting I had with a commissioner from the European Union.

He told me that in the USA, the average car uses nine litres of fuel for every 100 kilometres travelled. In Europe it’s five litres per 100 km. And in Formula 1, it’s down to three litres per 100 kilometres.

These numbers expose big differences in the efficiency of the global vehicle fleet.

More collaboration is an obvious but important way to find greater efficiencies.

With this in mind, Formula One designer Gordon Murray, engine experts Geot Technology and Shell scientists worked together to co-engineer a car body, engine and lubricant.

“For the foreseeable future, longer-distance heavy-duty road transport, freight shipping and aviation will continue to depend largely on energy dense liquid fuels, including oil, biofuels and liquefied natural gas.”

“Given the scale of the system, even with massive growth in electric cars, we believe the majority of vehicles will continue to be powered by internal combustion engines over the next couple of decades.”
The result is a city car that uses a third less primary energy in its lifetime than a typical city car.

This also car uses recycled carbon fibre for its body that can be assembled for a quarter of the price of a conventional steel car. Almost the entire car can be recycled at the end of its life.

Shell is now embarking on other similar collaborative research programmes. We have formed a partnership with Chrysler, for example, to reduce fuel consumption and CO2 emissions in vehicles by modifying hardware and fluid designs.

New fuels
Now how about new fuels?

All fuels will be needed to meet growing demand for energy, while transitioning to a low-carbon future.

That’s why Shell chose to invest in biofuels. Our Raízen joint venture with Brazilian company Cosan is the world’s largest producer of sugar-cane ethanol. It produces 70% fewer CO2 emissions than petrol over its life cycle. Last year, Raízen opened a second-generation plant. When fully operational, it’s expected to produce about 40 million litres of cellulosic ethanol a year, from sugar-cane waste.

That’s why Shell chose to develop a business in cleaner-burning LNG fuel for transport. Earlier this year, we signed an agreement with Carnival Corporation, the world’s biggest cruise operator, to supply LNG to fuel two of the world’s largest passenger cruise ships.

And it’s why we chose to invest in hydrogen. In Germany, we are partners with the government and five companies in a programme to install a national network of 400 hydrogen fuelling pumps in Germany by 2023. As you know, the only exhaust emission from hydrogen-fuelled electric vehicles is a small amount of water.

By 2025, we will significantly increase the amount of low emission fuels we offer our customers around the world. These fuels will have lower emissions than our current gasoline and diesel.

By this time we also aim to reduce the carbon intensity of our retail outlets by at least 50%. We will do this through low CO2 design, equipment and operations as well as embedding a low carbon mindset.

We also plan to reduce waste in all of our retail sites around the world through initiatives such as re-purposing coffee grounds as energy and buying uniforms made from recycled material for the 500,000 people working on our sites.

And it’s why we’re looking at ways to serve those who drive electric vehicles. Next year, we will set up electric charging stations at selected Shell retail sites in the UK.

We have also worked with customers in London, San Diego and Hamburg to ensure they avoided charging their electric vehicles at times of day when there is most demand. We encouraged them to charge their electric vehicles when renewable energy made up a significant portion of the power generation mix.

Not only does managed charging ease pressure on the power grids supplying these cities, it is also cheaper for the customers as they avoid the higher costs associated with charging their vehicles at peak times. Shell, in turn, benefits by being paid by the grids to help balance overall power demand.

Digital technology
Moving on, I’ll now focus on digital technology.

Technological advances mean people are increasingly expecting more from transport systems. More choice. More convenience. And faster and cheaper journeys.

Progress in both information and communications are allowing the integration of transport systems like never before and
giving people a range of cheap and flexible options beyond driving private cars.

The potential impact of digital services is huge. In Los Angeles, if the average car occupancy rises from 1.1 to just 1.3 passengers per car – through car-pooling and other such measures – traffic jams on the city’s highways could be eradicated.

We understand that relationships with customers will be significantly influenced by the continued development of digital technology. That’s why we’re embracing the new digital products and services that are enabled by new technology.

In fact, we recently won two gold ‘mobile marketing awards’ for both our Mobile app and our Mobile Payment Experience.

We were the world’s first company to introduce mobile payment in the UK forecourt for customers who want to ‘fill up and go’. I invite you to try it. We’d love to hear your feedback.

At present, we’ve got an early stage portfolio of digital products and services we’re developing and testing with customers. These are looking to create greater convenience, improve efficiency and reduce costs for our customers.

**Beyond vehicles**

In debates on the future of transport, it’s all too easy to keep an eagle eye exclusively on vehicles. But it’s also important to look at the roads and highways they travel on.

Could a road charge electric vehicles while they’re driving along it? Could a road prevent emissions from cars getting into the earth’s atmosphere? And could road surfaces glow in the dark?

These questions aren’t fanciful.

To turn them from ideas to reality, we’re working with Pavegen, a company that has developed paving slabs that convert energy from people walking on them.

We’re working on a bitumen technology that can absorb smoke, soot, dust and other particulates emitted by motor vehicles.

And our technology experts are exploring the feasibility of changing the visual appearance of road pavement surfaces to alert oncoming traffic to driving conditions or danger up ahead.

**No monopoly on good ideas**

We haven’t cracked these ideas. Not yet, anyway. They are among a huge number of challenges remaining when it comes to the future of transport.

This mustn’t stop the constant search for answers.

Nobody has a monopoly on all the good ideas. When you shut down ideas, you shut down opportunities.

On that note, I’ll conclude by putting a challenge to everyone in the room: never give up in the quest for answers.

Lizzy Lawrence is someone searching for solutions. I believe Lizzy is here with us tonight.

She was part of the UCL team, which took part in the latest Shell Eco-marathon, a competition which challenges students to come up with the most fuel-efficient vehicle.

Lizzy is in her final year at UCL, studying mechanical engineering. During the Eco-marathon project, she came up against technological problems she couldn’t figure out. She kept on thinking to herself: imagine what we could achieve if we had someone that was ‘tech savvy’ on our team.

This prompted her to apply to study computer science for her next master’s degree. She’s determined to take on a new discipline to find answers to the questions she had.

Lizzy’s drive is endemic among participants of the Eco-marathon. In 2011, a young PhD...
student called Konstantinos Laskaris took part in the competition.

Konstantinos and his team mates built a prototype electric car, and finished in seventh place. He’s now the principal motor designer at Tesla.

Through the Eco-marathon, Shell is pleased to foster creative engineering, which could lead to innovations in any sector.

Now I’ve never entered a car into this competition. But I do know what it feels like to overcome a car-related challenge.

Years ago – please don’t try and imagine how many – I had promised to pick up my girlfriend who was 100 miles away. But my trusty red Mini wasn’t working. At one point I didn’t think I could fix it.

But I persevered, removing and replacing the entire cylinder head to fix one small part. It was worth making the extra effort to get the Mini up and running. That girlfriend became my wife.

Just like Haiying – the cashier I mentioned at the start – I found my partner for life.

Future choices
So there you have it. Providing much more energy to more people with far lower emissions is achievable.

Ultimately, it’s down to the choices consumers, governments and energy companies make.

I’ve run through many of the choices Shell has made. There are many more choices to come, in our hunt for more and better solutions in the transport sector. Watch this space.

Thank you.

For information about Shell, including speeches and other publications, please visit www.shell.com.

© Shell International Limited, 2016. Permission should be sought from Shell International before any part of this publication is reproduced, stored in a retrieval system, or transmitted by any other means. Agreement will normally be given, provided the source is acknowledged.

The companies in which Royal Dutch Shell plc directly and indirectly owns investments are separate entities. In this publication the expressions “Shell”, “Group” and “Shell Group” are sometimes used for convenience where references are made to Group companies in general. Likewise, the words “we”, “us” and “our” are also used to refer to Group companies in general or those who work for them. These expressions are also used where there is no purpose in identifying specific companies.