



Making the right choices

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Jessica Uhl became Shell's Chief Financial Officer and an Executive Director in March 2017.

Jessica joined Shell in 2004 and has held Finance leadership roles in Shell's Upstream, Integrated Gas and Downstream businesses, as well as in Projects & Technology and Corporate headquarters.

She was previously Executive Vice President (EVP) Finance for the Integrated Gas business and has held roles including EVP Finance for Upstream Americas, Vice President (VP) Finance for Upstream Americas Unconventionals, VP Controller for Upstream and Projects and Technology, VP Finance for the global Lubricants business and Head of External Reporting.

Jessica joined Shell in finance and business development supporting the Renewables business. Prior to that she worked for Enron in Houston and Panama (1997-2003) and Citibank in San Francisco (1990-96).

Jessica is married to Michael and they have three children. In her free time, apart from spending quality time with family and friends, Jessica enjoys going for extended walks, reading and some small scale farming at their home.

When it comes to climate change, making the right choices is hard. Especially since the world faces a dual challenge: dramatically cut back on emissions and simultaneously increase the production of energy. Jessica Uhl argues this challenge doesn't have a silver-bullet answer. Instead, says Uhl, we should choose a broad perspective, with a multitude of solutions and an approach that embraces change.

Ladies and gentlemen,

Georges Doriot was the founder of INSEAD and is known as the world's first venture capitalist. Imagine a venture capitalist in 1908. Imagine they were searching for the best opportunity in automobile technology. Ford would seem to have been the obvious answer: Henry Ford started his assembly line that year and we all know what happened next. This is, however, with hindsight. At the time, the investment choice was much harder. There were hundreds of car companies at the beginning of the 20th century. And many of these were presenting innovations. Take Doriot Flandrin... a French car company that used advanced aluminium pistons in its motors and that was founded by Auguste Doriot... Georges Doriot's father. Or the Rainier Motor Car company that introduced the first warranty on a car. Or the Carter Car that used chainless transmission. These companies all presented innovations that pushed the car industry forward. But if George Doriot had invested in his own father's company, or either of the other two, this University would probably not be here right now. Because Doriot Flandrin, The Rainer Motor Car Company and The Carter Car all went belly-up while Ford sold 15 million Model T's.

This brings me to the subject of today: the challenge of making the right choice. For individuals, it can be difficult to make the right choice. This struggle usually gets bigger when more people and viewpoints are involved. Let alone when it comes to climate change, where everyone is involved and the choices are as complicated as they get. To some, this might seem an odd thing to say. After all, there is widespread agreement that the world must drastically reduce carbon dioxide emissions. The Paris Agreement, which Shell supports, is clear about this: the world must stay below a two degree Celsius temperature rise. And Paris

is not all... the thirteenth of the 17 UN Sustainable Development goals, which were agreed in the months before Paris, says the world must 'take urgent action to combat climate change and its impacts'.

But, as you all know, agreeing on the outcome is much easier than agreeing on how to achieve that outcome. So it is with tackling climate change. On that same list of UN sustainable development goals, number seven reads: 'Ensure access to affordable, reliable, sustainable and modern energy for all.' In fact, it would be very hard to achieve the rest of the goals – from ending poverty to ensuring good healthcare – without good, extensive access to energy. Energy has played a role in all the significant innovations that have shaped our way of life. Whether it is the steam engine, space travel or the Internet of things.

Dual challenge

This means there is actually a critical dual challenge: on the one hand, the world needs to transition to a low-carbon future to tackle climate change. On the other hand, it needs a lot more energy. Demand for energy is expected to go up. In part because the UN predicts the world's population will grow from 7 to 11 billion people over this century. In part because the living standards of this growing population can be expected to go up... and that means higher energy use. For some people that will mean something as simple as a first lightbulb... because over a billion people in the world right now have no access to modern energy at all. For millions of others, the choices are more substantial. In China, between 2000 and 2015, some 400 millions refrigerators were built. And to give you some idea of what is going to happen over the next years: today refrigeration in India is at about the point it was in the early 2000s in China. Last year, 1.7 trillion dollar was invested in the worldwide energy

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system. It would cost tens of trillions of dollars to rebuild this system. These two factors – a rising population and rising living standards, mean the amount of energy the world uses could double – at least - in size over the course of the century.

So the world agrees... it must dramatically cut back on emissions and simultaneously increase the production of energy. But does the world, in fact, need to choose one or the other? Personally, I think the future is brighter than that. I believe the world can manage to achieve both. But there will be a lot of other choices along the way. I think those choices can be broadly grouped into three sets: choices linked to perspective, others about solutions... and choices about our approach to the challenges facing the world.

Perspective

Firstly, perspective. It is natural to view a challenge from your own perspective, based on your own experience. But with a global challenge like the energy transition, this can mislead. It can even lead to an information bubble, in which people never see anything that conflicts with their own viewpoint. I do not believe that is a healthy place to be.

Consider the battery electric car, for example. There are currently 1 billion passenger cars on the road in the world. Only 2,5 million of these are electric. So we see initiatives to speed electrification up. Britain wants to ban new cars that are conventionally powered from 2040. France too. If you walk around the streets of London these days it is becoming more common to see battery-powered vehicles amongst the traffic, or plugged in at the side of the road. In a few months' time [Jan 2018] all new black cabs in London have to run on electricity. From the perspective of a British car driver... from the perspective of a European car driver... the future of transport looks like it is battery powered.

But it is a misleading perspective. It forgets that heavy trucks cannot yet be powered by a battery – it would need to be far too big –

and that both ships and planes still need liquid fuels. While we may well see some short haul commuter planes using electricity by 2040, that isn't remotely likely to be the case for an A380 from Paris to Hong Kong. Nor does it consider the scale-up in various mining industries to supply the materials for the batteries such as lithium, cobalt, nickel and manganese. It also does not take into account large parts of the world in which the battery electric car is not so suitable for reasons of geography, infrastructure or relative poverty.

Battery electric cars are certainly part of the solution for densely populated urban areas, but if the world is to find a complete solution, it needs to take a broader perspective... one that includes all players and all circumstances. It needs to start off with the perspective that the energy transition will move at different paces and produce different outcomes in different countries.

Solutions

That brings me to the second group of choices before the world... the choices around solutions. Just as with transport, the picture is more complex than it might initially appear. Take renewables as an example. Undoubtedly, solar and wind power are indispensable and the world needs much more energy to come from these sources. But they are not the simple solution to everything many people think. Renewables chiefly produce electricity. Today, electricity meets nearly 20% of global final energy demand. If the world was to meet the entire planet's current electricity needs through wind and solar... it would still have some 80% of final energy demand to deal with.

So for renewables to have a bigger impact, the use of electricity needs to be extended. According to the Energy Transition Commission eventually half of all worldwide energy consumption can be electrified. This would be a necessary - and formidable - accomplishment, but that still leaves the other half. Why is that? It is because some sectors of the economy cannot be electrified to the full extent. I have already mentioned

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heavy freight, shipping and aviation. But as the International Energy Agency shows, transport accounts for only 28% of the energy use. 23 % is used in and around our houses for heating, cooking and using appliances. 49% is used by industry and services. Part of these industries can also not be electrified. Because they need extremely high temperatures, chemical reactions or dense energy storage, such as the manufacturing of iron, steel, cement, plastic and chemicals. As much as the world needs renewables, they are not the universal solution to bringing down emissions.

The energy transition encompasses a multitude of different challenges and requires many different solutions. To return to transport briefly. Battery electric cars are coming, but we also need to do better with what we already have... with more efficient, cleaner engines... to keep emissions as low as possible as new technology spreads. And battery electric is not always the answer for every class of vehicle. The current limited range of batteries, and the time taken to recharge, means that cars powered by hydrogen – which have longer range and fast refuelling – may also have a role in the future. Liquefied natural gas can reduce pollution from shipping and freight ... While the next generation of low-carbon biofuels can play a role in aviation. Just as the world's perspective should be broad, so it should take a broad approach to solutions.

New energies

Shell is also working on many solutions itself. We have recently established our New Energies business, to focus on creating fresh commercially sound opportunities in the energy transition. It is a business tasked with working out how Shell's expertise can be valuable through the energy transition. For example, Shell has interests in windfarms and through its joint venture Raízen, Shell is already one of the world's biggest producers of sugar-cane ethanol. Shell is also developing hydrogen as a transport fuel, for example by helping to build a nationwide network of hydrogen filling stations in Germany. And Shell is

involved with battery electric vehicles too. We have developed a system to help the grid handle the coming influx of electric vehicles, for example. At a local level, the grid cannot yet cope with too many drivers plugging in their cars at the same time. The charging system communicates with the grid so cars take energy when there is plenty of it. That saves our customers money too.

Besides our New Energies solutions, carbon capture and storage, or CCS, is another essential part of the solution to meet the challenge of climate change. That's not just my view, it is the view of the International Energy Agency and the Intergovernmental Panel on Climate Change. This last organisation has calculated that keeping a 2 degree Celsius pathway would cost global society 140% more without CCS. Because the Paris Agreement sets out a formidable task for the world – to go from 40 billion tonnes of carbon dioxide added to the atmosphere every year, to an effective state of zero – and to do this in about 50 years. As I have explained, we cannot have a world of zero emissions in 50 years, but a net-zero emissions world is a different objective. And it can be achieved. Capturing and geologically storing carbon dioxide kilometres below the surface is a key solution. Shell has built and runs a CCS facility in Canada that prevented over a million tonnes of CO₂ from entering the atmosphere last year. It is doing the same this year too. The world will eventually need thousands of such facilities, another reason to focus more broadly on a solution that actually solves the problem.

All of this work I have mentioned, and more that I don't have time to tell you about, can contribute to the global effort to tackle climate change. But the biggest contribution Shell can make to this effort right now, however, is through its gas business. Gas is the cleanest-burning hydrocarbon, producing around half the greenhouse gas emissions and less than one-tenth of the air pollutants that coal does when burnt to generate electricity. This gives gas an advantage when used to complement renewable sources of energy. Ensuring that

the grid can supply electricity all day and every day; irrespective of the season or the conditions outside.

Whether it is with our New Energies business, with carbon capture and storage or with gas, Shell's approach is about seeking different solutions for different challenges. That is partly because the company cannot foresee exactly how this energy transition will play out. It is also because Shell sees a wide and exciting array of opportunities before us, created by this energy transition. The company purpose - providing more and cleaner energy solutions - is all about being a world class investment case that is in tune with the energy transition... and emerging as a winner from that transition.

Approach

And that brings me to the third choice. The choice of how we approach these challenges at a societal, governmental and corporate level. Do we let climate change drag us down? Or do we use the challenge to lift us up? As I just mentioned, Shell sees lots of opportunity through the energy transition. There is plenty of opportunity available for all types of business and enterprise... and for you all in this room. The right investment climate is essential if the world is to seize on the opportunities that exists. Personally, I would like to see coordination, consistency and a government-led carbon price for CO₂. A continuation and extension of the coordination witnessed in the Paris agreement. Consistency of regulation to allow long-term business decisions to be made. And a government-led carbon price which has the effect, over time, of incentivising both businesses and consumers to choose lower-carbon options. Such a carbon price can also allow the market to

efficiently identify the best solution for the best circumstances without governments having to try and pick "winners".

Ultimately, however, this energy transition will come down to the choices made by individuals. By people like you and me. The willingness of individuals to embrace change will be crucial: from changing the car we drive or the way we heat - or cool - our home, to the type of house we live in and the products we have in it. All of you are making these sort of choices already. But all of you, with INSEAD behind you, have the opportunity to make a large impact through the choices you make in the businesses and governments lucky enough to have you.

Ladies and gentlemen,

In 1908 Henry Ford installed his assembly line, which made him into one of the great innovators in manufacturing. Today, 109 years later, there are still parts of the world where people have never seen or heard of an assembly line. Then as now: things change differently in different places at different speeds. As much as we might like one, there is no universal, worldwide single solution to deal with climate change.

Instead we must make choices. I hope the world chooses a broad perspective. I hope the world chooses to accept a multitude of solutions to the complex challenges it faces. More than anything, I hope the world chooses an open-minded spirit that embraces change. And if you, the people in this room... INSEAD students and alumni... can adopt that spirit ... if you can lead and seize the opportunities before you... I think the world will benefit.

Thank you.

"Shell's approach is about seeking different solutions for different challenges."

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