

## **British Institute of Energy Economics: The Future of Energy Lecture**

### **The UK's Energy Future: A Call for Greater Urgency**

#### **UK Country Chair: Sinead Lynch**

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Good afternoon ladies and gentlemen.

It is a pleasure to be here in the Royal Society, the world's oldest national scientific institution. The Society's motto, "Nullius in verba" or "take nobody's word for it" is a timely reminder to keep debates and theories rooted in facts...

Today, the Society's spirit of scientific inquiry continues to bring people together with different perspectives to explore the world's challenges. And I am honoured to be talking to you about what I believe is perhaps the biggest of them all: how to tackle climate change.

I will talk about the UK energy system and some of the changes that need to be made to reduce greenhouse gas emissions.... I will also talk about my company and the role we can play in the UK's energy system, and its transformation.

Because the changes I will outline are the changes that will give Shell confidence to accelerate our investments in low-carbon energy in the UK.

I know that climate change is a topic that arouses a lot of emotion and much debate. The events of recent months... with activists taking to the streets all around the world to call for urgent action to combat climate change ... have brought that into sharp focus.

Here in London, we felt the impact of these demonstrations, with significant disruption on the roads and, in Shell's case, some damage to our UK headquarters.

It would therefore be easy to assume that those of us who work in the energy industry... and the climate change activists... are on different sides of the debate. But I would like to be really clear. I do not see it that way.

Today's challenges are not about "us" and "them". They are about each and every one of us.

We are on the same side and we all have a role to play. It is all too easy to talk about what others should do. In fact, I think there is far too much of that already in the debate.

The reality is that all sectors of society — governments, companies and consumers — depend on each other to make this transition successful.

I agree with the climate protesters that the challenge the world faces has become ever clearer since governments signed the Paris Agreement in late 2015. I agree that the world needs to move to a low-carbon energy system and reduce its dependency on fossil fuels in the years and decades ahead. I also agree that this has to happen faster than current policy frameworks and political agendas provide for.

But then there are also some key areas where our views inevitably diverge. One of these is about timing, and how fast the world can make the transition to a new energy system.

This will not be an easy transition and it will not happen overnight. Different countries will move at different paces, depending on their natural resources, stages of economic development and industrial strengths.

But first, a little context... think about how many big energy transitions we have had in the UK over the past few centuries? The answer is: not many. That is because, as you in this audience will well know, large-scale energy transitions are complex. They have a tremendous effect, involving long-term, structural change in the whole energy system.

When Sir Christopher Wren gave the Royal Society's founding lecture in 1660, candles lit the rooms, log fires heated hearths and people travelled in horse-drawn carriages.

It was not until the second half of the 19<sup>th</sup> century that kerosene provided brighter lighting. The beginning of the 20<sup>th</sup> century before cars began to replace horses. And the second half of the 20<sup>th</sup> century before gas-fired boilers replaced coal to heat the UK's homes.

But here's the thing. Those changes happened because there was a better technology that was both affordable and accessible. A better system developed – and people adopted it. But this time it is different. Today's transition is not like the others. This time there is a critical environmental need to reduce emissions across the global economy, to tackle climate change and improve air quality.

And there isn't a universally better system ... not yet. Though the UK has made great progress in areas such as renewables, much of the low-carbon energy we are going to need is still not cheaper or more convenient for most consumers. Governments and companies must work together to find the best ways to steer society through this transition. Because the world does not have the luxury of time.

So, what might a better system look like and when does it need to be in place?

The report by the Intergovernmental Panel on Climate Change, published in October, gave a stark assessment of the difference between a world where warming is limited to 2 degrees Celsius... and one where it is limited to 1.5 degrees. The report identified 2050 as the year in which the global economy should attempt to reach net-zero emissions in order to limit warming to 1.5 degrees with a 66% probability.

Shell carefully reviews the IPCC scenarios, and those produced by other UK institutions such as the Energy Technologies Institute and the Committee on Climate Change.

We also produce our own scenarios. These are not forecasts, but they frame our understanding of the various global and national pathways to a low-carbon energy system. Our scenarios team has been informing Shell's thinking and strategy for almost 50 years.

One of Shell's most recent scenarios, called Sky, shows a possible pathway for a rapid energy transition that achieves the goals of the Paris Agreement.

Sky shows that a net-zero emissions world is technically, industrially and economically possible. But it also clearly shows the scale of the challenge ahead.

In Sky, for example, the world has achieved widespread electrification by 2070, with a five-fold increase in the amount of energy consumed as electricity.

This switch means that the world needs to add a global electricity system... one that is the size of today's system.... every decade for the next 50 years

Our Sky scenario sees a net-zero emissions world by 2070... but an economically developed country like the UK can, and should, go faster.

The Committee on Climate Change made its position clear a few weeks ago. It said that the UK needs to be more ambitious and must achieve net-zero greenhouse gas emissions by the middle of the century to achieve its targets under the Paris Agreement.

Shell contributed to the development of the Committee's advice, and we support this recommendation. I hope that the government will accept it.

Because at the moment, the UK is still moving too slowly to achieve its climate goals.

There is good news... the UK has a strong track record in this area. A decade ago, the UK Climate Change Act set the pace for other countries to follow.

This legislation has driven changes in our energy system. The UK has achieved more than a 40% reduction in emissions since 1990... with more than 70% economic growth over the same period. This shows it is possible to decouple emissions from economic growth.

But the Committee on Climate Change's report lays bare the challenges that the UK faces today in achieving even its current ambitions.

While carbon emissions from power generation have fallen significantly, other sectors, such as transport and heating, are moving more slowly. And there are headwinds — the UK is not yet on track to meet its future carbon budgets.

It is crucial that new technologies are enabled and then supported in their deployment by well-designed policies. Nowhere is that seen more clearly than in the power sector.

The government has made real progress in reducing emissions from power, because it had clear goals and policies, namely the decision to end unabated coal generation by 2025, the introduction of the carbon price floor and financial support for cleaner technologies such as offshore wind.

On the back of those policies, the mix in UK power generation has changed dramatically.

Last year, coal accounted for around 5% of UK power generation, down from around 40% in 2012. Renewables accounted for 33% against a few percent in 2012.

Earlier this month, the UK recorded more than eight days without burning coal to produce electricity, the longest period since the 1880s. And the UK now has the largest installed offshore wind capacity in the world.

So we know that decisive government policy supporting new technologies does work.

Now is the time to build on those achievements. There is still a long way to go to reduce emissions from power generation, and of course, the power system we are decarbonising is growing.

Our Sky scenario shows deep electrification of the UK energy system... of around 60% by 2050, compared to around 20% today. The way forward seems reasonably clear.

And as long as the UK ensures a route to market for cost-effective, low-carbon generation, and it builds a market for flexible assets like storage over time, then a zero-emissions power sector, or close to it, should be achievable by 2050.

Other sectors, especially transport and heat, need the same kind of targeted action as power... because although today the UK has ambition and some good strategic direction, the policies needed to drive the energy transition in transport and heat are not in place.

Take transport, which makes up around 40% of energy consumption. Although the government has already made significant steps, including stating its intention to end sales of new cars powered solely by petrol or diesel by 2040, emissions from transport are not falling.

Only around 2.6% of new cars sales in 2018 were electric, including plug-in hybrid electric vehicles.

That's low and the UK is starting to fall behind other European countries.

In Shell's Sky scenario that I mentioned earlier, and the Committee on Climate Change report, sales of new internal combustion engine cars in the UK need to stop years earlier than the 2040 existing target.

It is possible to do this, and other countries have demonstrated how to accelerate change. They have shown that the most effective way to change the composition of the cars on the road is through a combination of driving change... such as the zero-emission vehicle programme in California, which requires car manufacturers to offer a specific number of the very cleanest cars available...

AND incentives...such as government subsidies for buyers of electric vehicles in Norway and the Netherlands, and of hydrogen vehicles in Japan and California.

In all cases, beyond support for vehicle purchases and improving infrastructure, governments need to ensure there is a system that is convenient and easy to use for customers.

Today, market forces alone are not enough to bring about the changes the UK needs.

That's why I believe the UK government should rethink its decision to reduce the grant encouraging people to buy new plug-in battery electric cars ... and rethink its decision to exclude plug-in hybrids ... because many drivers are nervous about switching from petrol or diesel to more expensive electric cars, and not everyone can afford it.

And, at the moment, the charging system in the UK is neither convenient nor easy to use, because drivers have to provide their details to many different operators to ensure they can use the nearest charge point.

This must be made easier. Customers should be able to easily use any charge point, no matter which company owns it. In other words, we support interoperability when it comes to payments, and the legislation needed to make that happen.

An earlier ban on sales of new internal combustion engine cars may well be needed. But this move in isolation is not likely to deliver the changes to customer choices and behaviours that are required.

The right infrastructure, financial incentives and, of course, a compelling and convenient offer to customers, are crucial.

The same principles apply in heating.

This is another sector where change is not happening quickly enough, and for good reason, as it is undoubtedly one of the hardest areas to decarbonise.

Shell agrees with the recent announcement by the Chancellor — that homes built after 2025 must support the UK's 2050 target and therefore cannot rely on fossil fuel heating.

But the government also needs to address the far bigger question of how to reduce emissions from the 23.9 million existing homes that are heated by natural gas.

Solutions will likely include electrification and low-carbon gases such as biomethane produced from waste, or hydrogen.

Switching from gas to electricity by installing fully electric heat pumps will certainly be part of the solution, particularly in new and well insulated homes. But electric heating is expensive today and potentially inefficient to retrofit into old houses.

Like many of you, I'm sure, I have first-hand experience of this particular dilemma.

I live in a house that is old and draughty. And although I have installed a great deal of insulation, from top to bottom, and double glazing... halving my energy bills since I moved in... I doubt that electric heat pumps alone will ever be enough to heat my home.

Switching from gas to electricity for homes would also require an enormous increase in low-carbon generation capacity and electricity network infrastructure... to cover demand in the coldest weeks of winter.

There is much focus on the slow replacement of natural gas in the grid with hydrogen. An advantage of hydrogen is that much of today's gas network could be used to deliver it to customers.

But the roll-out of hydrogen, like electrification, also has significant challenges.

As with the switch to electric heating, it would require replacing millions of hobs and boilers, street by street.

It would require local production and storage. But, most critically of all, the mass market production of hydrogen will likely rely on carbon capture and storage in the UK... because producing hydrogen from gas creates carbon dioxide... and carbon capture and storage does not yet exist here in the UK.

The Committee on Climate Change says carbon capture and storage is a “necessity, not an option”. We, at Shell, agree.

So decarbonising heat poses some big challenges but is possible, with the right policy framework.

And there are steps the UK can take to reduce emissions from UK homes in the short to medium term; including more urgent action on insulating homes, greater use of biomethane in the grid, and trials of solutions such as hybrid heat pumps and the blending of hydrogen into the grid alongside natural gas.

Shell, for example, is interested in the role of hybrid heat pumps... which can switch between gas or hydrogen and electricity and limit the increase in electricity demand while taking advantage of the existing gas infrastructure.

Whatever the final answer, the UK urgently needs a roadmap in the heat sector to set it on the right course. The government has committed to delivering this by 2020 and we hope it will be genuinely comprehensive and ambitious in scope.

The last sector I am going to talk about is industry, and here again all scenarios are clear. Energy efficiency is vital and so is electrification where possible. But some sectors such as cement, steel or chemicals are likely to require fossil fuels for decades to come because of their need for intense heat or chemical reactions in the industrial process... and here carbon capture and storage again will be critical to eliminate emissions within a timeframe that is compatible with the Paris Agreement.

Today, carbon capture and storage is not a commercial technology. The early projects will need clear policy support to create a business model which can attract investment from the private sector, and appropriate risk allocation between industry and government, to reach anything near the scale suggested by the Committee on Climate Change. And the time for this is now – as the government’s own carbon capture usage and storage action plan makes clear.

I said at the start that everyone has a role to play and I have talked about the action government needs to take. But we are crystal clear that Shell must take action too.

We are listening to investors. We are listening to society. We are partnering with others and we are changing.

One of the most significant steps Shell has taken is to set an ambition that will, over time, radically change our portfolio.

We have set the ambition to reduce the Net Carbon Footprint of the energy products we sell in step with society's progress towards meeting the Paris Agreement. This is a measure of carbon intensity, expressed in grams of carbon dioxide equivalent per megajoule consumed. We aim to reduce our Net Carbon Footprint by about half by 2050, and by about 20% by 2035.

This ambition includes not just emissions from our own operations and those created by the companies that supply our energy... but, critically, it also includes our customers' emissions when they use the energy products we sell.

In December, we went a step further. We set shorter-term Net Carbon Footprint targets, linked to our executives' pay. We will set targets each year, for the next three- or five-year period.

Today, most of our investments are in developing oil and gas resources because we expect continued global demand in the decades ahead as the global population grows and the world becomes more prosperous.

Even in a developed economy like the UK, where oil and gas will steadily decline, we still see demand for oil and gas out into the middle of the century.

At the same time, we are investing in low-carbon energy, to find the best commercial opportunities, and to ensure our company thrives through the energy transition.

In 2016, we created our New Energies business, which focuses on new fuels and power. We plan to invest between \$1 billion and \$2 billion on average every year up to 2020 in New Energies... in power supply, solar and wind power generation, electric vehicle charging and battery storage.

We aim to make power a significant business for Shell, one that in the future could sit alongside oil, gas and chemicals. This means being involved in almost every stage of the power supply, from buying and selling it, to supplying it directly to customers.

Last year, Shell purchased First Utility, or Shell Energy as it is now called. This was a big step for us. We are now supplying 800,000 UK homes with power,

natural gas and smart home technology for the first time – and we are supplying them with 100% renewable electricity.

We have also bought a company called Limejump, a digital platform based in London which helps small generators of renewable energy optimise their sales of electricity to the grid.

And bringing both new fuels and power together, Shell is also investing in battery electric vehicle charging in the UK. Shell Recharge brings rapid-charging to our retail stations. Today, most of our chargers are 50 kilowatts. This allows drivers to charge their cars in as little as half an hour.

We are now introducing faster 150 kilowatt chargers.

Today we have more than 30 of these sites across the UK. We are also installing super-fast charge points of up to 350 kilowatts throughout Europe with the operator IONITY.

This is a great example of partnership. Through IONITY, we are working with BMW, Daimler, Ford and the Volkswagen group, with Audi and Porsche. The charge points will take around ten minutes to charge the next-generation electric vehicles... and we are installing 500 points in our forecourts across 10 countries, including the UK.

We know, of course, that many of our customers will charge at home. That drove our acquisition of NewMotion which provides charging for electric vehicles in homes and workplaces.

But we're not just focusing on battery electric vehicles. We are also looking at hydrogen as a potential transport fuel... and are piloting hydrogen refuelling stations in the UK in partnership with ITM Power and Toyota, with funding from the UK's Office of Low Emission Vehicles (OLEV). We have two sites now operating in Cobham and Beaconsfield, one more to open shortly and OLEV funding in place for three more.

So Shell is acting. But we know that we will need to go even further and even faster. And we are looking at other opportunities in the UK.

For example, we are part of a group of companies studying the feasibility of building the first carbon capture and storage project in the UK... including working with the government to agree the right policy support and business model.

The project is linked to a planned new gas-fired power station in Teesside, and the ultimate decarbonisation of industries in the area. In the first instance, the plant will capture CO<sub>2</sub> from the gas plant and transport it by pipeline into depleted oil and gas reservoirs in the North Sea.

And we are looking at opportunities to invest in offshore wind generation, as we have done in the Netherlands, where we are developing two offshore wind farms to add to the existing one we have operated for more than ten years.

I have talked about what the government is doing. I have talked about what Shell is doing.

And then there is the role that each and every one of us must play. Because we are all consumers.

We can make lifestyle changes, such as choosing to walk, cycle or use public transport.

To take just one example, I was in Manchester recently and heard about the introduction of a cycling and walking network to help end the 250 million car journeys a year in the area that are under one mile.

The reality is, we all need to take action. Because we depend on each other to make this transition work.

The world, society, the UK... cannot simply sit back and expect this energy transition to succeed without huge effort on everyone's part. This is an energy transition like no other in history. It needs to be driven faster than usual transitions because it is driven by the need to address climate change and other environmental concerns such as air pollution.

And it will not happen by itself in the timeframe we have. It will require great commitment. It will require unprecedented collaboration. It will require innovation and far-reaching action to ensure it can be done in a manner which minimises costs, allocates those costs fairly, and provides economic opportunity to the UK and companies that invest in the country.

Shell will play its part and offer low-carbon products. But we need customers to buy them, and governments to support them... so that these products also make commercial sense.

The UK has achieved a great deal. In many ways, the UK government has set an admirable pace. But the UK can, and must, go faster.

Thank you.

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