HOUSE OF LORDS

Economic Affairs Committee

Corrected oral evidence: UK energy supply and investment

Tuesday 22 February 2022

4.05 pm

Watch the meeting

Members present: Lord Bridges of Headley (The Chair); Viscount Chandos; Lord Fox; Lord Griffiths of Fforestfach; Baroness Kramer; Lord Livingston of Parkhead; Lord Monks; Lord Rooker; Lord Skidelsky; Lord Stern of Brentford.

Evidence Session No. 2 Heard in Public Questions 16 - 29

Witnesses

I: Paul Spence, Director of Strategy and Corporate Affairs, EDF; Emma Pinchbeck, Chief Executive, Energy UK.

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Examination of witnesses

Paul Spence and Emma Pinchbeck.

Q16 **The Chair:** Thank you very much for coming, and sorry to keep you both waiting. Welcome. Would you like to introduce yourselves?

Emma Pinchbeck: I am the chief executive of Energy UK, which is the trade body for the energy sector. To be clear about what that means, we cover generation, retail and the wider system but not upstream oil and gas production.

Paul Spence: I am director of strategy and corporate affairs for EDF in the UK, representing a company that has interests in generation and supply to industrial and residential customers. I am lucky enough also to be one of Emma's board members at Energy UK.

Emma Pinchbeck: You say that before I have given evidence.

Q17 **The Chair:** We have had a very interesting session, and I left it thinking that there seems to be a plan and we seem to have many of the issues that I am concerned about relatively well covered. However, we have had several energy strategies published by Governments over the last decade or so. If you are lying awake at night worrying about where we need to be investing more, where do you think we need to be looking, where should the Government be stepping up and where should the private sector be stepping up?

Emma Pinchbeck: As Mr Critchlow said, the overall trajectory is good. In the 10 years that I have been working in the energy sector, I can tell you that our governance framework has been widely copied, particularly when it comes to the carbon budgets but also the contracts for difference auction and that partnership between government and the private sector. It has been hugely successful. If you look at electricity, the emissions reduction that we have achieved while maintaining economic growth has been impressive. To that end, the government strategies are the right ones. We support pursuing a very strong net-zero target as a sector. We broadly support the overall trajectory. A lot of the energy White Paper is good, the 10-point plan from the Prime Minister is good, the sixth carbon budget is fine. We have a very good overall architecture in the UK.

Where we worry is delivery. The next 10 years in particular will be challenging. We have to bring on the renewables fleet while also maintaining security of supply. In Whitehall there are pressures and challenges outside of net zero that often make it feel that this huge economic agenda gets overlooked. Rachel Kyte, who used to be at the World Bank and is a commentator on this area, said that the UK is dad dancing—are you familiar with this phrase?—where we are not particularly co-ordinated. We have the right set of strategies but the wrong implementation.

The other thing that I often think about with government is the time and the scale, the pace of implementation. It is about one to two investment

cycles for large infrastructure, which means one Parliament for the policy-making that you require in order to get the markets in place to have those investment cycles in order to get to where we want to be as an industry in the 2040s. It takes about eight years to plan and get consent for a wind farm, but only about one year to build one. That is madness in terms of pace. A lot of that is to do with non-market barriers, like planning and consenting processes, again in Whitehall.

There are two fundamental decisions that keep me up at night. The first is the role of government in net zero versus that of the private sector. We know that there is about £50 billion of private capital investment every year from the CCC, but what is often not quoted is that only 10% of that is supposed to come from the state. The rest of it is private capital that we think is there but you need to enable it. What will that relationship be like going forward? The other big question is: where do we pay across the system for it? I listened to the conversation about levies, but where in the economy do you pay for it? The cost-benefits case is clear, but there is that allocation point.

There are some system challenges that I am sure we will come on to: namely, over the next 10 years, the role of gas and making sure that we keep investment up and keep the lights on while we are doing the transition. That is not about capacity but about operability. We are very clear in the energy sector that it will be a renewables-led system that is much more flexible and much more dynamic, so it is about making sure that we manage the next 10 years but then build an architecture and a set of markets for a very different environment.

Paul Spence: I had not heard the "dad dancing" quote before, but if I can follow that analogy for a second, we need to pick something a bit more up tempo than what we have had so far. The direction is great and, as Emma said, we have seen the right announcements, the right strategies, coming from the Government. The ambition is great, but we are not moving at the pace that we need to as a country on delivery, investment, offshore wind, onshore wind, solar, nuclear, the energy efficiency of our households, the rollout of electric vehicles. Therefore, we need to multiply the money that is being deployed.

As Emma said, most of that will come from the private sector, hopefully with some pump-priming, some support, from the Government. But in order for that money to come from the private sector, and if we are to decarbonise the system as a whole, there needs to be clarity in the framework that there will be something to invest against and a return at four or five times the level of investment that is going in each year for the next 10 or 15 years. That is the primary thing.

As to whether we are investing in all the right places, the one that is universally acknowledged to be the furthest behind at the moment is what we do about the heating stock—how we heat our homes and our industries and how we make sure that we are as efficient as we can be in what we are heating.

Those two pieces are not moving fast enough at the moment by any stretch of the imagination. The rest at least is moving forward.

The Chair: Thank you both very much. To paraphrase, are you saying that it is the lack of clarity and certainty and the policy frameworks that are detaining us, and that the investment is potentially there from the private sector if you get that clarity?

Paul Spence: So far, the evidence is that with the right framework the investment comes. We have seen that in the performance improvements in onshore wind. We have seen that in offshore wind. The money is there, the appetite is there and it is great that we have seen the annual auctions as opposed to two-yearly auctions. The money is there, the projects are there. With nuclear we are moving through the process to have a regulated asset base approved in legislation. The hope and the expectation is that that will then unleash the money that we believe is there. Yes, it is about the framework and the clarity.

Q18 **Lord Rooker:** Thank you for coming. On the point that you made about heating stock, we have 26 million or 27 million dwellings. It is the one area where the public get really affected. All the rest is choice—cars, transport. When you come down to it, how can we get the message across that the public have to co-operate and go with the changes? It is a bit like the pandemic in a way; people changed their behaviour because they got a clear message to start with about what was happening, and behaviour changed. Does it require public behaviour to change to get acceptance of the need to move faster, as you point out, on the heating stock?

Paul Spence: The simple answer is yes. Emma talked about what we have already achieved as a country in the electricity system. A lot of that was completely hidden from most people. That can carry on. Obviously it affects the communities that are involved where a wind farm, nuclear station or carbon-capture plant is put, but beyond that we can do it without changing people's lifestyles.

Your choice of car, your choice of transport, is the first point at which you are being asked to make some choices. We have had the debates about range anxiety, we have had the debates about charging infrastructure with cars, but for all 28 million households the potential disruption from changing out your gas boiler, investing in having a more energy-efficient home and maybe operating at a lower level are all behavioural changes, which will have a bigger impact.

I would like to say that the industry recognises that, and I think the Government recognise that with the heat and building strategy, but there is a lot more public engagement to be had. Industry can start to make the offers. We have to make it attractive for our customers to want to make those changes. We need help in the early stages to find the early adopters and to support them to bring the costs down. Then we need a collective campaign to make the case for these changes and why they need to be made.

Q19 **Lord Stern of Brentford:** To pick up that point, it is beyond the simple behavioural story, even though that is very important. You need the local authorities, you need the energy companies, you need the banks, you need the builders. Somebody has to bring that together—some combination of government and local authority, along with the three or four different stands of industry. Would you agree that it is becoming urgent now to put those together? One way of doing it could be to take two or three local authorities that are up for it and move very quickly. If we do not, would you agree that we are in deep trouble on that front?

Paul Spence: I am very concerned about the pace of movement on the heating piece in particular. There are trials, there are communities, there are local towns and cities that are pushing ahead, but they are relatively small-scale experiments at the moment and we need to massively up the pace on that piece of it.

Lord Stern of Brentford: Insulation is part of that story in a big way.

Paul Spence: Absolutely, yes.

Emma Pinchbeck: I think that is right, but it is also wrong on heat. I say that in this job, and it is a very recent realisation about heat. I started my career working on heat and there are some big institutional barriers. It is the area of the economy that keeps me up at night, like everyone else, for decarbonisation, and there are some very clear roles for the Government. One, I completely agree, is regional planning and looking at the role of local authorities. Perhaps we could talk about institutional reform more generally and who has the responsibility for this at different levels of government.

There is also a piece about R&D and innovation. We know that we need more investigation into what hydrogen can do, if it can do it, in the gas grids. There will need to be a decision about the gas grids post 2024. There are some big-ticket infrastructure things, and there is a decision about financing and where the levies sit on electricity or gas, or indeed about introducing a carbon price on gas, or any of the things that change the customer proposition. These are all within the Government's gift.

However, I increasingly believe that the energy suppliers—EDF is one—can come up with an interesting commercial proposition for the able-to-pay market. We traditionally think about heat through your heating engineer and your local plumber as being a government role. A new proposition is emerging that is about the electrification of heat in particular and the added tariffs and services that you can get with that, along with things like a solar PV or an EV. That is hugely exciting, because it reduces the need for public capital, it gets innovation into the sector, you get customers excited about the technology proposition and you may get the sorts of cost reductions at the speed that we see in the private sector and with onshore wind that we have struggled to get with heat.

Lord Stern of Brentford: You are not suggesting that the energy

companies could do it by themselves. That would be a bit hard.

Emma Pinchbeck: Some of the suppliers believe that they can hit 600,000 heat pumps a year if you get the commercial proposition right. That is contingent on some policy changes—simplifying the customer journey and making sure that things like EPCs work, that the relative cost of electricity and gas stacks up, that the Government's new clean heat grant actually delivers. There is real ambition on the technology front, because they see the opportunity for new energy services in the 2030s.

Lord Stern of Brentford: To be clear, at one point you seemed to say that the energy-supplying companies could do it by themselves, but at another point you gave what I think is the right answer, which is that you will need the tax system, the energy system, the finance side, the local authorities, the builders coming together for this to work.

Emma Pinchbeck: It is a bit like everything else where it will have to be a partnership between government and industry. There are things that industry can do and do very well—cost reduction for technology, getting the commercial proposition right—and there are things that are very much in the Government's gift because they exist in policy, like where the levies sit, or because they are to do with large infrastructure like the decision on the gas grid and where we use hydrogen, if at all. Then there is the piece I talked about. Heat will need a good bit of co-ordination. Energy UK's position is that we should also do some regional planning. It is a mix.

I have highlighted the complexity of heat, but I am saying that the piece that often gets overlooked is how exciting the commercial proposition could be and that that is part of what you can do for consumers, as well as the traditional way we talk about it, which is to talk about fuel-poverty reduction, health benefits, infrastructure projects, energy efficiency of our buildings and so on. There is also this other exciting, emerging piece.

Q20 **Lord Griffiths of Fforestfach:** I am interested in the response that you cannot analyse the supply side independently of the demand side. That is a very important point that needs to be emphasised.

Let me just read the question that I am meant to ask and then, if I may, I will elaborate on it. Is there sufficient investment in secure and affordable energy sources to ensure that recent rises in energy prices do not become entrenched? Particularly to Mr Spence, you are a major supplier and a major investor. As an investor you are calculating the risks of the investment. One hears the news this morning that we are increasingly living in a world of radical uncertainty. With the best people calculating what the returns and costs may be, it is very hard to grapple with Frank Knight's real uncertainty. You as a firm are in a key position. If, in a way, one was to make the question relevant to your firm, are you making sufficient investment in securing affordable energy or is there a spectrum going from risk to uncertainty where in the end you feel that you cannot go further than this?

Paul Spence: Let me answer in two bits. We have totted up what we think is the investment that we are helping to make happen, what we are putting in from our own balance sheet and the projects that we are championing and that then we hope to attract other people's money into those projects as well. In total, it comes up to about £50 billion worth of investment in wind farms onshore and offshore, nuclear power stations, solar energy and electric vehicle charging infrastructure. It is also about starting to draw on some of our experience from markets like France, which is much further ahead than the UK when it comes to things like heat pumps, and to ask how we can bring those here. My team would probably shoot me if I did not mention energy efficiency as well. We are investing in all the things that are part of what is needed, and in R&D and innovation.

Are we doing enough? We are doing our relatively small part. We serve about 10% of UK residential customers and about 20% of UK industrial customers and we generate about 20% of the electricity that the UK needs. You probably need 10 companies like mine doing that. I look around and I do not see 10 other companies doing it in the same way at the same scale. That is what worries me. I do not see how it all then adds up to be a total picture that is large enough to do what the country needs.

Is that for want of trying? Going back to Emma's point, I can see some of the investment opportunities today, I can see the prospect of other investment opportunities that make it worth doing the early-stage work and allow me to make the case to my main shareholder in Paris that the UK is a good market to be part of. That has been made a bit more difficult this last year with the energy crisis, but in general there is a recognition that the UK has a very strong framework and a very rational approach to its energy policy.

The questions we get are about the scale of the ambition versus the delivery and which is going to give, because my investors do not want to be investing in the belief that we will meet the full ambition only to discover that we have decided to stop half way.

Lord Griffiths of Fforestfach: So you are looking to have that assurance from the Government that they will be there to deliver.

Paul Spence: Yes. The contracts for difference framework is a fantastic success. I cannot be more positive about what I have seen for offshore wind from that. It also helped with the first nuclear power investment at Hinkley Point. Quite frankly, EDF cannot do the next nuclear project in the same way, so the regulated asset structure is another very positive step to help that next investment in nuclear work. If that goes through as intended, if we see the investment decision this Parliament as the Government say is their intent, that will be the next piece of the jigsaw that is well set up. I do not today have a networks business as part of what EDF does. We used to have one of those. Again, the regulatory framework is a good framework for making some of the investments, but it is about pace.

Q21 **Lord Livingston of Parkhead:** A very quick question. Paul, you commented on investment between EDF's markets. The UK has taken a very different approach to recent energy challenges than France has. Would that encourage investment in the UK relative to markets that may have taken a different approach, without putting you too much on the spot about France's actions on energy power?

Paul Spence: I am hesitating, because the answer is slightly different for the different technologies. Some of it comes back to where our inherent advantages are.

Lord Livingston of Parkhead: I am talking about the certainty of the market. I am trying to get a market framework and say that this is a good market.

Paul Spence: The contracts for difference framework in the UK has been very good for making the case for EDF investing in wind in the UK. By contrast, wind has developed much more slowly in France. Until recently, France was domestically a bit more ambivalent about new nuclear than the UK has been. The success was that the first new nuclear project was happening here in the UK with Hinkley Point C. We have recently seen the French Government be a lot more bullish about the next phase of nuclear in France. I am giving you a slightly longer answer because there is no single perfect framework to get everything built in the same way.

The Chair: Lord Griffiths, do you have anything else to ask?

Lord Griffiths of Fforestfach: Many things, but I should not monopolise.

Q22 **Lord Fox:** Coming to nuclear energy and the role that it has or may have in the transition towards net zero, Paul—and Emma, if you would like to pitch in too—do you think that nuclear has a role in that transition, and what that role might be?

Emma Pinchbeck: I will lead Paul in by saying that we support nuclear energy. We are across technology and technology agnostic. In that sense, we follow all the balanced cost pathways, and all of them have nuclear in. They have different amounts of nuclear depending on how they do the system model, but every medium-cost pathway to achieving net zero has new nuclear in it. They are increasingly agnostic about whether that is large scale or small scale, apart from to say that the Government have committed at least to coming to a final decision in this Parliament on a 1 gigawatt nuclear project. There are, I think, 10 gigawatts of total nuclear in the sixth carbon budget medium pathway for 2035, 8 gigawatts of which is new build, so there is a significant amount of it.

When we talk about costs, it is tempting to look at technologies next to each other, but that is unhelpful across the piece. Onshore wind, offshore wind, gas, nuclear all have different characteristics, different system costs, different commercial proportions behind them, different financing. We think it is important to look at the whole system.

That, fundamentally, is something else that I would say to the Government. It is no longer about single technology choices or picking winners. What will work is how the whole system functions from end to end. In that sense, I suppose the short answer is yes, we do see a role for nuclear in the UK.

Paul Spence: I agree with Emma. First, we see a role for nuclear. We are at a time now where the 10 gigawatts of gas-cooled reactor technology that we used to have is closing. Last year, two stations for reactors closed. This year we will see Hinkley Point B close. We are on a trend where the existing low-carbon capacity and the UK's coal capacity is coming off.

We need something to provide that electricity and an increasingly electric system, and I am very positive about the role that wind can play. I think it can play an important role. Solar probably has a slightly larger role to play than it does at the moment. When I look at any model for a future system, the consensus is that the amount that is required for there to be manageable amounts of volatility and to make sure that the lights stay on when we need them to stay on, and that we are not overly wind or import dependent and at the most affordable cost, seems to be something of the order of 10 to 20 gigawatts of nuclear. Whether that is large or small is the second point.

Q23 **Lord Fox:** That is my second question, because that seems to me to be the problem, in that my understanding is that if Sizewell C got the go-ahead the day after tomorrow it would still be 2034 before it came on stream, and the Government are committed to decarbonising the power system by 2035. With all due respect to EDF, its ability to forecast when its power stations come on stream is not that accurate. For the Government to bet on that one would seem to me to be a pretty long risky bet, so the question I come back to is: how can nuclear contribute to the decarbonisation of the power supply when meaningful generation capacity cannot be delivered before the date when the Government have said that they have to decarbonise?

Paul Spence: Part of the answer is that we need to press on with the projects that we have at the moment. Sizewell B, I expect, will continue to operate well into the 2030s and we hope to the 2050s. Hinkley Point C will come on stream; we are half way through that construction and it will be in time. If we can move faster, Sizewell will benefit from the lessons that we have learned as we have restarted the industry.

The other point is that 2035 is not the cliff edge for decarbonising our economy; 2035 is the date by which we said that we need to find a way to have as low carbon an electricity system as possible. We as a country will increasingly be using electricity, more electricity, for our heating and transport, and I would advocate increasingly nuclear, large scale and small scale, to provide that energy. We need to take those decisions today; otherwise, we will be in the situation—

Lord Fox: It would seem that small scale has much more of a chance of

making the timings than the big ones, but we do not know that yet.

Emma Pinchbeck: You do not necessarily, and this applies across the system. There are some—I will quote someone else—known knowns and known unknowns, however that quote went, about what we are looking at in the future. Some things we are certain of. Renewables will be the incumbent form of generation, probably offshore wind and onshore wind in the UK because of the nature of our natural resources and because of the low cost. That is what we will have.

We think that it will be 70% plus. You have system models up to 80% plus renewables, but what the rest of that technology portfolio is depends on where the Government put their money, what the market framework is like, what comes forward in innovation and so on. Therefore, determining the exact outcome from some kind of central despatch model is not the world we are in anymore.

Paul is right. The other big constraints or opportunities are things like how flexible the system is overall and how many people charge their vehicles at different times of the day. With dynamic models, how many heat pumps do we get away or how much hydrogen do we do? The whole system and how fast we electrify dictate when you need your nuclear.

Lord Fox: Absolutely understood.

Emma Pinchbeck: I do not know the answer to whether it is small or large, but the point for the Government is that they should set up the frameworks and the outcomes they are after so that they get the right amount of capacity through. We are pretty agnostic about how that is delivered, with the exception of the things that are critical. We clearly have to have enough supply to keep the lights on over the next 10 years. We clearly have to run a system that is dominated by renewables.

Q24 **Lord Fox:** Paul Spence, you can probably come in on what you were going to say, because this question is for you. You have already said nice things about moving to a RAB system, so I am assuming that you are in favour of the Nuclear Energy (Financing) Bill. Do you want to suggest any improvements, because now is your opportunity? My question is about behaviour—in a sense, institutional behaviour—because the financial risk is being transferred from you or from the investor to the user. What expectation might we have of a change of behaviour of those who are now building these huge and very difficult projects, given that the imperative of financial risk has been moved from them to someone else?

Paul Spence: I will answer that and then give one additional thought, if I may. On that point, clearly we have a massive incentive, first, to build Hinkley successfully. We do not get paid until the station is built and until it starts producing electricity.

Lord Fox: That is exactly my point.

Paul Spence: That, shall we say, de-risks a further project using a copy of the design. If we are the ones building that second project, we know

how to build it, we know that we have a team of people who have built it and we can take all the engineering drawings. It is not quite as crude as crossing out Hinkley Point C and putting Sizewell in, but there is a lot of taking the proven design and re-enacting it. There is experience from France, Korea and China that shows that doing that is the best way to keep the risk during the construction phase as low as possible and to systematise the delivery.

Therefore, part of the answer to your question about the consumer risk comes from your having more assurance because this will be a copy. I am sure the Government will build incentives in and will expect there to be incentives on whoever is building the future stations.

Lord Fox: A lot of what you are doing is not design risk. It is execution risk, and that is not quite the same. You would have to do it twice, and some of the problems are the same.

Paul Spence: The execution risk is the piece that we are already seeing as we build the second unit at Hinkley Point and which we learned from building the first unit at Hinkley Point. If we take the same team of people and the same design and ask them to do the same thing in Suffolk, we can be increasingly confident that they will get it right and so the execution risk comes down. That was going to be my final thought.

Going back to Lord Livingston's question about the French, countries like France are saying that they want to do this in twins—two next to each other—but knowing that we will do six is the way to set up the delivery team, the supply chain, the factories, the manufacturing, the civil engineers, all of that, to make sure that we deliver it as successfully as possible. That is true time after time, whether you are building big reactors or small ones. We have seen it in offshore wind. It is the way to get delivery risk and costs down and delivery up.

Q25 **Lord Monks:** That was nuclear. What role will oil and gas play in the UK energy mix as we transition to net zero? These are pretty unfashionable sectors at the moment. How will they attract sufficient investment to ensure that they can continue to do the necessary job during the transition? I am certainly not suggesting that we take anything away from the new leading-edge technologies in which we need to invest. Will oil and gas go the same way as coal if we are not careful?

Emma Pinchbeck: Oil and gas production is not Energy UK's area of expertise, but we are expecting demand for fossil fuels to fall because of what has happened over the last 10 years. I would characterise the shift as being climate policy driving the energy transition and there now being a very clear new incumbent in the form of cheap onshore wind and solar in most global markets. That is now driving an energy transition that favours electrification, very broadly. That will be the dominant fuel.

The International Energy Agency's newest pathway to net zero is that there is no need for additional fossil fuel production, given the supply of fossil fuels. It is talking about gas declining by 75%. It is talking about oil

declining, and the per capita income from oil and gas-producing nations falling significantly in the 2030s.

Our specialism in Energy UK is generation. We are very worried about gas investment and the role of gas over the next 10 years, because for all the things we have just described there is a degree of uncertainty about the pathway. Gas is flexible. It is a nice complement to renewables, and there is a real worry that pressure on gas as a commodity and a fossil fuel will remove the gas fleet earlier than we need it to be removed. As an industry, we support no further investment in unabated gas without a clear transition plan and a transition away from gas in general. We believe in this future economy and the future model, so we can see a 75%-plus reduction in gas for heating and for power generation.

The challenge is that in 2035 we are not talking about a wholly no-carbon electricity system. We are talking about 0 to 45 grams of carbon dioxide equivalent on the system. That 45 is because we think we will still need a couple of unabated gas power stations to do back-up security of supply. It also suggests that we need 40 to 50 gigawatts of gas CCS, so abated gas technology, plus another 60 gigawatts or so of flexible technologies within which it is hydrogen being burned in gas turbines.

That investment case is critical. That is the bit we are worried about, so there is a very clear role for gases in the system, particularly over the next 10 years, but in an enduring way so long as it is low carbon. We are pretty worried about how we make sure that that transition is managed, and one of the big challenges for the Government will be market design. So that is that.

Lastly, on oil and gas, because of the change in the make-up of technologies and because of the energy transition, security of supply still tends to be framed as being about oil and gas and traditional technologies. Arguably, the system issues that need resolving are now much broader. They are things like low-wind periods, by which I mean two weeks of low wind—low-wind periods are fine; it is two weeks of continuous low wind where we lack a storage solution as it stands that is the problem—and unplanned outages on the system, other economic or market shocks like pandemics that radically swing demand, or things like cybersecurity. So our framing of security and resilience is also shifting, and it would be good to be able to explore that with the Government in more detail.

Paul Spence: I echo everything that Emma said about a purposeful and conscious transition. I do expect a continuing substantial role for the oil and gas sector.

There is one thing that Emma did not mention. At the moment, I have to worry about all those households that are heated with gas today that may be heated with electricity tomorrow. Until we know the path that they are going down, I want to be assured that we can still provide gas to do the heating and the cooking that my customers want. Gas, and the oil and gas sector, has a really important role in the transition. It will

decline, but it needs to be a consciously managed decline by the Government and the industry as a whole rather than an unmanaged collapse.

The Chair: Do you think it is being consciously managed, or are we facing the sudden collapse that you just mentioned?

Paul Spence: I see signs of both at the moment. Some of the rhetoric and the narrative is consigning oil and gas to history a bit prematurely, I think. A more active dialogue between the low-carbon industries, the oil and gas industry and the Government will be helpful.

Lord Livingston of Parkhead: Is part of the problem that the practicality is way more complex, particularly heat pumps. There are lots of places where it is probably physically impossible; technology is not quite there for a number of places. You may well need fossil fuel back-up. We have to be a lot more nuanced in understanding that this stuff will be a combination of multiple things rather than that there are any absolutes.

Paul Spence: The future system is much more complex than the system we have had in the past. The heating system will probably be a mix of some continuing gas—hopefully that will increasingly be biogas in the future—maybe some hydrogen, some district heating and some electric heating. Diversity will be part of what keeps the system—

Lord Livingston of Parkhead: Back-ups are back-ups—

The Chair: Sorry to jump in, but is your concern about investment in gas? If so, what aspect of investment in gas? Could you just drill down a bit?

Paul Spence: We are living through a period of massive volatility at the moment. Some of that is down to the production capacity. A lot of that is down to the transport capacity and the re-gas and distribution capacity. We have been through a period where the UK had abundant gas supplies. We did not necessarily always call it storage, but we had a lot of storage and it was called the North Sea production. We have moved away from that world and we are seeing some volatility as a result of that.

I am sure the molecules will always continue to flow from somewhere, but the price that we may have to pay, and may have to ask our consumers to pay, in a more volatile system and with growing global demand worries me. That gas could go to China or India or Africa, and it will come to the UK because our consumers will have to pay a higher and higher price. We need investment intelligently in all parts of the system with the right market framework to make it work.

Lord Stern of Brentford: You are saying that there are two types of danger in going too slowly: one is the vulnerability to the world markets, and the other is what we are doing to the climate.

Emma Pinchbeck: Yes, exactly. If I can add to what Paul is saying, it is a global commodities market over which we have very little control in the

UK. Some of the solutions that are being proposed, such as increased production or investment on the supply side, do not solve either the current gas crisis or the long-term volatility.

The only long-term solution is to reduce our gas dependency, and the sector is clear about that. It is one of the nice things about my job that we are rarely united but we are united on that front, on getting more of our consumers off gas boilers. More than 80% of the UK public has an individual gas boiler, and that has to change, as does making our homes more energy efficient—using less energy, full stop—with a power system that is driven much more by low-carbon and electricity generation: namely, by renewables and nuclear.

However, we are worried that there is no clear pathway for a managed transition for our gas generation fleet and, I would argue, for the related infrastructure on the demand side—the switch out to other forms of heating technology.

For gas generation, two things are needed. One is a pathway for the next 10 years, making sure that we have enough of the fleet maintained in the right places and that it is ready in the 2030s, if we are talking about one of the couple of unabated plants or a plant that is burning hydrogen. The second is the business models for hydrogen and carbon capture, and getting the alternative technologies that can be utilised with the gas fleet ready. There has been a government strategy on that but, again, it is about the implementation. As we know from wind, and from other large infrastructure, these things take time. Therefore, if the Government do not start imminently on this, we will not get there in time for the market. Those are the holes.

Q26 **Viscount Chandos:** I declare the interest that I am a shareholder in Greencoat UK Wind.

What are the main challenges as regards energy supply and storage, which public policy must address over the next decade? I was struck, Mr Spence, that when you ran through a number of priorities for investment, energy conservation was the last one; storage was not there at all. I do not know whether that was inadvertent or whether you think that is a reflection of its importance.

Paul Spence: No, it was inadvertent. We are investors in some largescale batteries that we have built and operate as part of the UK energy system. As Emma said, the thing we worry about is the two-week wind lull and the difference in demand between summer and winter. As yet, I have not seen storage technologies that operate with sufficient scale at a sensible cost to be able to bridge those sorts of gaps.

I do see storage playing an important role. I suspect that, for the wind lulls and for that longer-term seasonable piece, something like hydrogen is more likely to become the way we store the energy that we produce until the times we need it. Is there enough investment going into that at the moment? It is very challenging to make the investment case for investment in storage technologies at the moment. It is possible, but it is

very complex. You have to stitch together investment or projections about money that will come from back-up capacity, services to the grid, maybe some energy supply, maybe other services that you are offering. Together, that is a very complex piece and quite a difficult investment proposition.

Viscount Chandos: Does that imply essentially that there is a market failure and, therefore, that there needs to be government intervention or support?

Paul Spence: Not necessarily from the Government but between the Government, Ofgem and National Grid. They are working on a series of projects to identify these things, but a more coherent framework for some of those storage investments would be helpful.

Emma Pinchbeck: Storage is important, but the question is about energy supply, and again I come back to us being more worried about the interoperability of the system as a whole now than about capacity adequacy, which is a huge shift in thinking in the sector. That means that you need markets that are not just about procuring capacity but about procuring things like peaking services and flexibility. Generally, those have been less big priorities and less well thought through over the previous 10 years than where they will need to be.

On flexibility, if you get that right and get those kinds of markets and services right, it is worth something in the region of £7 billion to £8 billion on the system versus a more centrally driven inflexible one.

On storage, my thought is as Paul has said: that it is about lots of different technologies, and we need all of them at every level of the system. So your solution to two weeks of low wind is not a battery; it is about how the whole system works together as well as probably something like hydrogen. If you are looking at hydrogen, in order to use the storage you still need the hydrogen business models in place, you still need the investment in industrial clusters, you still need the investment models to do things like co-location. You probably also need the cost of electrolysers to come down. That in itself is a complex set of things that the Government can help with alongside the private sector.

If it is pumped hydro, there are clear rules for government working with the private sector there because of the nature of the scale of that project. If you are talking about batteries and flexibility technologies, depending on size the barriers are anything from market design through to the planning system. Again, the weighting of what the private sector or government will do depends on the kind of technology that you are trying to put in.

This goes right down to consumer levels. For example, electric vehicles are potentially tiny bits of battery storage on the system. Getting the markets right to incentivise people to charge their cars at particular times or maybe to get EVs to provide grid services is also part of the storage flexibility question. Again, I suppose I am not really helping you by

illustrating the complexity, but it is about the whole system, about getting the overall market framework right and about the outcomes you are after, because for each technology it looks very different. There are clear roles for government—and clear market failures, though.

Q27 **Lord Stern of Brentford:** My question is about driving down the cost of particular technologies. We have covered a lot of it, but I just want to underline the very last bit that you were talking about. It is clearly important to drive down the cost of storage, and drive it down very rapidly. I know that there are all sorts of different forms of storage but, without overcomplicating it, how do you think we can drive down the cost of storage quickly? Bearing in mind that we have had some success already, how can we accelerate that?

Emma Pinchbeck: I would start with the market. The flexibility of the market is the key. Of course, a lot of the time you are talking about things like batteries. People have to revenue stack or find bits of revenue through various complex markets, and it is incredibly challenging to get into that world, particularly down on the distributor bit of the system. So I would look at the balancing markets and try to get the revenue flows clearer for people and get the market entry easier. I would also make it easier to connect to the network; the grid at a number of levels is critical for these kinds of assets. That may well be enough.

The biggest thing in market design is deciding where the Government sit on how much they want to replicate the success that they have had with offshore wind in other technologies and to have procurement markets, or whether they want to try to get clear price signals through the system that require less intervention than where the private sector takes more of the risk. That is another big philosophical question, but the straightforward one is balancing markets up.

Viscount Chandos: If we move to a system where intermittency is the central problem for a large part of the supply, surely the economic implications of being the back-up—and, indeed, the climate-change issues relating to continued use of, say, gas for that role—imply that it is highly likely that we will need government support in some form or a change in pricing to make the renewable energy industry finance the back-up that they need.

Emma Pinchbeck: This is about whether renewables generation should also be paying for back-up at the same time. There are lots of different solutions, in the market design being proposed at the moment, for what the world looks like. That is one of them. Another is that, again, if renewables are your incumbent technology, you need markets and infrastructure design around them, so there is a tendency in the first model that you describe to frame renewables as the problem, as opposed to them being the incumbent form of generation so actually the system needs to change around them.

Another solution to what you are proposing is less government intervention and clearer pricing signals through the system. In traditional

market economics, if you can see scarcity there is normally a need, an investment drive, to build more capacity or to put a solution in place. There are different views among my membership, but some would say that you need less government involvement, that if you could just see the price signals and the capacity in the system more clearly from top to bottom, and you could capture the benefit of these clean electrons being generated at source right through to the consumer, the private sector could do more. If the system remains complex and intervened in, government needs to do more. Again, it comes back to what you think government's role is in that future system.

You are not wrong, however, in that it is a very different set of values, where flexibility will be the critical thing that people invest for. That comes back to why we think that storage should be more investable and that it is being held back by current market frameworks.

Paul Spence: As Emma implied, we need a smarter system to do all this, just for the information flows. Again, it is one of my oversights. I have not talked about the role of smart metering. We are only half way through the rollout of the smart metering programme to households, which would absolutely be required in a world where we are more able to flex our demand, because we would need to be able to see a price signal and then respond to that signal.

Having that smarter system and the infrastructure in place for that is another place where the industry has done something. I would argue that there is probably more that industry and government need to do together to encourage take-up if we are to get to there, whether it is for storage, demand turndown or price response. All of those require us to be a much more digital, smarter system.

Q28 **Lord Skidelsky:** I know that it is late in the day to ask a forensic question, but it seems to me that you are placing much too much importance on getting the market right. It seems to me that in Britain we have invested a lower share of GDP than our comparators for a long time and that the share of government investment in total investment has fallen dramatically. Why do you think we will be able to improve on that investment performance in making a transition to a green economy? Surely it is not just that the Government have to have an improved role in regulation—I agree that they do—but that they have to have an investment function in this.

My question, therefore, is this. What do you think are the possibilities of a well-capitalised national infrastructure bank with a mandate to do certain things and to invest in those things, because otherwise you are relying on private investment to achieve the targets? It is not just a question of what role the Government have but what role they have in investment.

Emma Pinchbeck: I am the spokesperson for business, which is why I am very pleased to be able to make the case for the market. That is my job.

Lord Skidelsky: You have done it very well.

Emma Pinchbeck: Thank you very much. It is a good thing, because when you hear the conversation about net zero or the energy transition, there is often a lot of focus on the cost and it is not followed up with how much of that is expected to come from private industry because they see this as an economic opportunity, and obviously because of the altruism of companies like EDF.

In terms of the Government's role and the infrastructure bank, there are some things that we do need government to do and that we have learned our lessons from. We definitely describe this is as a partnership. Stable frameworks and setting the outcomes that you expect, whether on fuel poverty, security of supply or net zero, are the Government's jobs, as is designing mechanisms in a way that is competitive so that the market can do what it does well, which is to innovate and drive down costs. Establishing carbon pricing is a government job. Deciding where the costs sit in the economy is a government job, whether it is taxation or bills or wherever. Non-market barriers, the planning system, consenting, grid, involving the public are all now critical barriers.

On your question about government investment, we welcome the UK Infrastructure Bank. It should be used to do what we have done very well in other technologies, which is to crowd in investment in the early stages and de-risk technologies.

I have a favourite example. I get asked all the time why we are only just beginning to manufacture wind turbines at scale in the UK. You hear a lot of people saying, "Why are there not more factories here?" The answer is that we did not invest early enough. We had the earliest wind turbines in development in the world with our research programmes in universities and early-stage trials in the UK. We are very good at early-stage R&D investment, but often we do not have the market design or the appetite for investment to get those technologies to market, so we lose the development stage to other countries and get them back later in their cycle.

We think that one of the roles for government is pump-priming the early stages of technology, so that you do not just get low-cost energy technologies here, which are great—offshore wind has been a huge success story—but you also get the industrial benefits. That is the clear role for government finance, so we absolutely welcome the UK Infrastructure Bank.

Paul Spence: Emma said it much more eloquently than I could ever hope to, but I would be delighted if, alongside private capital, which I know and expect will be needed, the Government invested particularly in the areas where it needs starting. I can see a number of areas, maybe nuclear, almost—

Lord Skidelsky: Carbon storage.

Paul Spence: Yes, carbon capture and storage. There are plenty of areas where it is difficult for the private sector at the moment, and if the

Government invested it would be a very positive signal and would help to crowd in others' money as well.

Q29 **The Chair:** This question is about financial regulation, which is where we ended the last discussion. To what extent do you think the approach of the UK's financial regulators and others around the world is getting the balance right between ensuring that we move to a green renewable future while also ensuring that we get affordable, reliable energy? I am thinking here specifically about gas. Is there a danger that we could see financial regulators moving very fast and therefore undermining investment in gas exploration in particular, which could ramp up the cost of gas in the short to medium term?

Paul Spence: For me, it comes back to the idea of a purposeful transition. There is a risk that without a clear purpose and without a recognition of transition technologies—we have seen a debate in Europe about both nuclear and gas in that context—we will end up with too little of the gas that is still needed, and, if I look at Germany, perhaps too little of the nuclear that will help them to be slightly less reliant on Russia than they are at the moment.

There is a very real risk that ill-considered financial regulation could accelerate the move out by funders of some of the technologies that we need through the transition period.

The Chair: Is that risk increasing or decreasing at the moment?

Paul Spence: I have not seen the Treasury's deliberations on its taxonomy to know. I am pleased to know that Treasury is looking at that question. I am pleased that there is the attention to climate risk and the requirements of transparency that your previous witness talked about. All those things are reasons to be positive. It then needs to be enacted and made real, and we need some real-world experience of how it is applied, because we all know that it is one thing to have some principles and some rules. How they are applied by each financial body that is the real test of whether it is right.

Emma Pinchbeck: If they look at the taxonomy alone they will get the wrong answer. The greening finance road map and the taxonomy are very welcome. Driving investment into the technologies which the industry is saying are the ones they want to back is a good thing. Forcing companies to think about climate risk and resilience is a good thing. In fact, Energy UK, along with lots of other organisations, is recommending the same thing for the Treasury and the Green Book. We should be doing it in the public sector and not just in the private sector.

What would give my members security is knowing that the energy markets and the signals to our investors on the generation side are clear about the transition. So long as energy policy delivers, the signal to our financiers about the kinds of technology that we want to invest in is fine. The big risk, as I said, is not getting gas demand reduced at the speed that we know we need it to reduce by for resilience, and not having

investment in things like carbon capture and hydrogen, which we know we need in order to transition the fleet. These are the things that are worrying the gas generators, along with gas supply. Driving investment in the right direction for net zero is not necessarily a problem, so long as you have energy policy that delivers.

The Chair: Yes, very good. I am sorry that we have gone over time, but that was an extremely useful and thought provoking session. Thank you.