HOUSE OF COMMONS

Environmental Audit Committee

Oral evidence: Technological Innovations and Climate Change: Offshore Wind, HC 287

Thursday 4 June 2020

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Watch the meeting

Members present: Philip Dunne (Chair); Duncan Baker; Feryal Clark; Mr Robert Goodwill; Ian Levy; Caroline Lucas; Jerome Mayhew; Dr Matthew Offord; Mr Shailesh Vara; Claudia Webbe.

Questions 1 – 52

Witnesses

I: Andrew Jamieson, CEO, Offshore Renewable Energy Catapult; Rebecca Williams, Head of Policy and Regulation, RenewableUK; and Benj Sykes, Head of UK Market Development, Consenting and External Affairs, Ørsted.

Written evidence from witnesses

Offshore Renewable Energy Catapult

Ørsted

Examination of witnesses

Witnesses: Andrew Jamieson, Rebecca Williams and Benj Sykes.

Q1 **Chair:** Welcome to the Environmental Audit Committee. This is the first session of our inquiry into overarching technological innovation and climate change. I am very pleased that we are starting with the subject of offshore wind, which has been such a critical component to the UK doing well in raising renewable energy generation. I would like to ask our witnesses to introduce themselves, please.

Andrew Jamieson: Good morning, everyone. My name is Andrew Jamieson. I am the chief executive of the Offshore Renewable Energy Catapult, which was founded in 2013 and is the UK's leading force in driving innovation in offshore renewables.

Rebecca Williams: Hi, I am Rebecca Williams. I am the head of policy and regulation at RenewableUK, which is the UK's leading renewables trade association.

Benj Sykes: Good morning. I am Benj Sykes, and I am currently the industry chair of the Offshore Wind Industry Council, which is a partnership between industry and Government to promote and progress offshore wind. I work for a Danish offshore wind developer called Ørsted.

Q2 **Chair:** Thank you very much. Andrew, I would like you to give us a very quick overview of the current installed capacity, roughly how long it has been in place, when it will start needing to be replaced and what the role is of the offshore wind sector deal, which the Government set up just over a year ago in seeking to stimulate investment in the sector and achieving net zero targets.

Andrew Jamieson: I may call upon the assistance of Rebecca and the trade association for statistical help.

Rebecca Williams: No problem.

Andrew Jamieson: We currently have about 8.5 gigawatts installed in UK waters. The UK has done very well in driving renewables into our energy system since the formation of the renewables obligation in the early 2000s with, as I say, 8.5 gigawatts installed today and many megawatts in the pipeline. We are very optimistic towards the sector deal targets of 30 gigawatts by 2030. Indeed, we have been looking to move that to 40 gigawatts within the same timeframe. Since the sector deal was published—which we should talk about more deeply because it is a tremendous relationship document as a minimum between Government, industry and, indeed, many stakeholders—the Committee on Climate Change of course published its report, which said for net zero we need to do significantly more. It was talking targets of at least 75 gigawatts of offshore wind by 2050. Very interestingly, none of us thinks that is not doable. It is all entirely achievable, we just have lots of things to line up to allow those pathways to flow, and of course it would be a tremendous

boost to the UK's clean energy production, but also to the UK's economic productivity as we look to do more and more, not just of generating clean electricity, but also of the manufacturing and the servicing of such renewable power sources, so very exciting times ahead.

Rebecca Williams: Andrew got the stats completely right. We have around 8.5 gigawatts installed at the moment, and that provides power to around 7.5 million UK homes. It is also providing about 13,000 direct jobs in offshore wind.

I wanted to pick up on the economic opportunity that Andrew mentioned. This inquiry is obviously timely, as this country exits from lockdown and looks to provide economic solutions and opportunities to deal with the effects of the coronavirus pandemic. Offshore wind can play a huge role in delivering investment to communities up and down the UK, which will really be in need of it. For example, by 2030 we expect to deliver nearly £50 billion of investment around the UK, and that could equate to around 27,000 jobs just in developers and tier 1—that is the top level supply chain—alone, so the economic opportunity is absolutely huge, but so is the social opportunity to provide those high-value, high-skilled jobs in communities that need it.

Picking up on the ambition point that Andrew raised, yes, we see a pipeline of around 38.5 gigawatts at the moment. We have a bit of a stretch target for 40 gigawatts by 2030 and I think the industry is absolutely united in believing that we can achieve that target. However, what we need now is a programme and a roadmap that takes that collaboration with Government further and faster in order to achieve that.

Q3 **Chair:** Could you explain what the difference is between a pipeline and a target?

Rebecca Williams: A target is an overall ambition that is set. A pipeline is what we see coming through and the building process, so that can be projects that are in planning right now and it can be projects that are in construction, which includes projects that we see coming through the Crown Estate's extension programme, but it does not include projects that we do not know about yet. It is what is achievable looking forward, bearing in mind what stage of the planning and development process projects are in.

Q4 **Chair:** I think you used the figure of 38.5 gigawatts in the pipeline.

Rebecca Williams: Yes.

Chair: Is that therefore identified locations with licensing or with applications in for Crown Estate licensing? These are projects that you can see and you can map?

Rebecca Williams: Yes, absolutely. The next stage will be the Crown Estate further leasing process.

Q5 **Chair:** Which would take us beyond 38?

Rebecca Williams: Yes.

Q6 **Chair:** Does that indicate that the Government's 40 gigawatt target by 2030, the stretch target that you described, is achievable?

Rebecca Williams: Yes, it is absolutely achievable because we are already a great deal of the way there and we will only need that small amount of extra capacity to reach that target. I think that is why the industry in general is so confident that we can achieve that target, but as I mentioned, it comes back to the point around needing a programme to be able to unlock the opportunities there. It is an absolutely achievable target, but we need to make sure that we have the frameworks in place to achieve it. We cannot just rest on our laurels and expect it to come about by itself.

Q7 **Chair:** We will be coming on to some of the barriers that might be getting in the way during the course of this session. Are there any specific aspects of fresh Government support that would be required? Is that what you mean by the framework?

Rebecca Williams: The partnership that we have had via the sector deal so far has been absolutely instrumental in providing that confidence not just to the developer community but also to the UK supply chain that they can build out projects. Going forward, what we need to see is a more strategic approach to investment in UK supply chain, but also a more strategic and co-ordinated approach to address some of the challenges that we foresee. There are some potential barriers to the deployment of those levels of offshore wind.

We can overcome those barriers, but we need to work in partnership with Government to achieve that. A specific example of a barrier to further deployment of offshore wind at the moment would be the interaction between offshore wind and the aviation sector, but the sector deal has workstreams and provides that framework to address some of these barriers. It is just that we now need to see greater co-operation, and we need to see it going further and faster in order for us to address those barriers so we deploy that level of offshore wind in line with our net zero targets in a timely manner.

Q8 **Chair:** Benj, would you like to come in on this? In particular, could you highlight how annual Contracts for Difference—the auction system—might help to meet this target?

Benj Sykes: To echo what Rebecca and Andrew have said, there are some challenges to get to 40 gigawatts by 2030. Later this year or early next year we will have about 10 gigawatts. Just to put it in context, we have to get into the water three times as much capacity in the next decade as we have done over the last 20 years, so that is a huge challenge. Of course the turbines are bigger so it does not mean that many multiplied number of turbines, but the Contracts for Difference are

an absolutely essential element of the ability of the industry to bring in the investment that will be needed.

Rebecca talked about the £50 billion of infrastructure investment into the UK that this sector will deliver over the next 10 years. That is only made possible because the Contracts for Difference model, which has worked well so far, will continue to attract the financing that will be needed to sit behind that £50 billion of investment. The CfD process is tried and tested, and it is great to see that BEIS is consulting on extending the window over which CfDs will be used out to 2030. I very much hope we will see that continue. I think without that we will struggle to bring in the money.

Q9 **Chair:** How much of the installed capacity is going to need to be replaced contemporaneously with the increase in capacity quadrupling, as you have said?

Benj Sykes: Repowering existing windfarms, which is the phrase we would use, is probably not going to be a major activity in this decade, but it will certainly kick off in the 2030s. It will be an important point in terms of making sure that we can reach those net zero volumes that we will need in 2050. I am sure at some point we will talk about hydrogen and the important role that hydrogen will play in the interaction between hydrogen and offshore wind, and where that offers opportunities for the UK in technology and supply chain terms. Repowering is important because we have transmission infrastructure that we want to continue to use beyond the natural life of the wind turbine, so we can put new turbines in and use the same infrastructure without having to build more.

Q10 **Duncan Baker:** This is an area that is particularly important in my constituency of North Norfolk. We will have off our coast over 50% of all the wind turbines being built in the United Kingdom, and I think they will produce nearly 60% of all of the energy, so it is quite an apt area for me. We hear a lot about how the costs have come down quite considerably over the years, so can we just focus on that in a little more detail? No matter the fact that the costs have reduced, how do they compare with other renewable technologies?

Rebecca Williams: Offshore wind is one of the cheapest forms of electricity generation that we have. I think you are right to point out the huge cost reductions we have seen in this sector. We had a target to achieve a certain amount of cost reduction, and we absolutely smashed that quite a few years early. We have seen at the last CfD auction, which Benj was mentioning before, record low costs of £39.60 per megawatt hour. Offshore wind is absolutely one of the cheapest forms of electricity generation. The opportunity to use offshore wind to power and decarbonise the rest of our economy cheaply is also huge.

To compare with other forms of generation, it is a little difficult to compare with onshore wind, for instance, because onshore wind has not, for the last few years, been able to participate in the Government's CfD auctions. The Government are currently consulting on the next auction

round. They have decided to bring onshore wind back into the mix there, and we are absolutely delighted to see that. But absolutely, offshore wind is one of the cheapest forms of not just renewable energy generation but electricity generation in general and, as such, will play a huge role in decarbonising our economy at the cheapest cost to bill payers.

Q11 **Duncan Baker:** It is like everything in business, when you start to shave the costs, they come down quite dramatically at the beginning. Andrew, how do you expect the cost to continue to fall? Where can you get more gains when we have already seen such a dramatic fall? To coin a phrase, is there any more skin in the game?

Andrew Jamieson: Yes, absolutely. We have had major successes in cost reduction through everything from larger-scale volume deployment, so economies of scale for manufacturing have obviously been critical in all of this, as has upscaling of the size of the turbines. So 10 years ago, turbines were being put in the water at 3 megawatts. The numbers do not mean that much, but now we are looking at 12 megawatts and the industry has recently announced a move to 14 megawatts and beyond. Basically, the bigger the turbine, the more swept area it can capture and the more wind it can capture, and that has been massively bringing down the cost.

Alongside the technology development in scale have been all the ways of doing things, so learning through operations and maintenance, learning how to make the technology more robust, uprated longevity and so on. All of these things are adding into the mix. In the Catapult we have some of the biggest test, validation and open access systems in the world based in Blyth, near Newcastle. We are working with GE Renewable, which is commercialising a 12-megawatt turbine to come to the market very soon. That has helped us absolutely thrash the previous cost that the industry was presenting and the cost of electricity.

If I go back 10 years ago and think about the achievements that the industry has made—I have been in this industry a long time—we were hardly in a reckoning in those days and we were constantly challenged about, "Can turbines get bigger? Can we do anything more in operations and maintenance that would reduce cost?" I have learned the lesson very hard: it is very difficult to say, "No, we cannot go further." There are loads of opportunities that can still be done, from the tips of the turbine through to the generator itself and delivering the power back onshore.

What I am particularly interested in is that the UK itself, in terms of our supply chain and supply chain growth opportunities, can do lots of these things. We have been right in trying to create the capacity installed in the UK, but as Rebecca and Benj have been saying, I think now is the time to focus on the supply chain because it is the supply chain that truly brings the innovations to bear. They are looking for better product, cheaper product, longer-lasting product. All of that to me says jobs in the UK, and I find that just as exciting as what it means for things like low-carbon generation.

Duncan Baker: That is excellent, really positive. There are two areas there that I had not thought about, but it makes total sense on scalability to then drive down costs further, so thank you very much.

Q12 **Ian Levy:** Good morning. Obviously, being the MP for Blyth Valley, I work very closely with the Port of Blyth and have been down to see the facilities there. Benj, could you please explain how floating windfarms could unlock so much offshore power generation in deeper and more remote waters? What would you see as the benefits of developing those offshore windfarms in the UK?

Benj Sykes: Floating wind is still in its relatively early stages. We have one five-turbine floating windfarm off the Scottish coast, off Peterhead, but it is a technology that is rapidly developing, and I think it will become an important part of the UK's energy mix. We know bottom-fixed offshore wind will do the heavy lifting out to 2030 and possibly continue beyond that, but I think from the 2030s and certainly 2040 onwards, floating wind is going to be competitive and will provide an opportunity to spread out the distribution of offshore wind as we move to 75 or potentially even 100 gigawatts of offshore wind by 2050. From an electricity system perspective, offshore wind has great potential. I also think it does from a supply chain perspective, absolutely.

I am an oil and gas guy, 20 years in upstream oil and gas, so I have spent a lot of time in Aberdeen. There are some fantastic skills up in Scotland, but also up and down the north-east coast of England, where we have manufactured mooring systems and anchoring systems, all of these large structures that we know will be important for floating. It is not without its challenges. There is obviously some technology that we need to develop, and Andrew and the Catapult are very much focused on that, but I think the UK, having been and remaining a world leader in bottom-fixed offshore wind, has every reason to believe we can do the same for floating wind, in terms of both supply chain and deployment.

Q13 **Ian Levy:** That leads me on to my second question, which I would like to direct to Andrew. How advanced is floating wind technology, and what are the main barriers and risks to its development?

Andrew Jamieson: I have a very optimistic outlook for floating wind. If we go back some 10 years ago, I chaired a report for Government called the Cost Reduction Task Force, which presented in 2012. At that point we had offshore wind costs at around £140, £150 a megawatt hour. We set a target of £100 a megawatt hour by 2020, and here we are bringing projects to bear at £40 a megawatt hour. I am just giving that in terms of the context of what people thought was achievable. There were lots of sceptics saying, "You can never bring that cost down fast enough" and I think we are now in the same domain for floating wind power. The costs are considerably higher than the cheapest available. Obviously it is a new technology, different solutions and so on, but there is nothing, to my mind, to say we cannot develop the scale and the volume that is necessary.

In fact, the turbines themselves are not significantly different from any other turbine that sits in a fixed foundation. It is much more about what they sit on, which is the floating structure. That is oil and gas technology, so for me we have to be putting our arms around our oil and gas colleagues, who obviously need a new future; they are looking to decarbonise. My business is working very closely with the Oil & Gas Technology Centre, which is pooling innovation across oil and gas. How does that connect to our industry and our sector? We can see real positives in taking the technology, understanding the marine nature of oil and gas floating technology and bringing that more to bear in the UK.

Of course it leads again to major manufacturing opportunities, not just in fabrication, but possibly even to the scale of shipbuilding because the structures themselves are colossal, with lots of tonnage of steel and so on, so we need to be very clever in how we design them, how we put them together and how we install them. The Catapult is creating a Floating Wind Centre of Excellence so we can pool all the very best of the brainpower to see how we would design these things in future, how we would optimise these things. What level of public sector support is required and is appropriate to be putting into the very fast cost reduction and scaling of this industry? If we look at net zero challenges, we will have to go to deeper water; we will have to go further from shore.

Benj is quite right, there is still lots of opportunity in fixed-bottom technologies, but the longer-term future is going to be floating wind, not just in the UK but globally. I would be delighted to see the UK capture as much of the IP opportunities in manufacturing and ultimately export opportunities in everything from the knowledge around it through to the manufacturing that we can take around the world.

Q14 **Ian Levy:** That is great. Obviously there are risks involved in going into deeper water, and I appreciate that, but how might changes to the Contracts for Difference framework allow floating projects to successfully compete for those contracts?

Rebecca Williams: Yes, that is a great question. To pick up on the point that Benj and Andrew were raising, the UK is a world leader in offshore wind and now the next stage of our world-leading opportunity is to capture the market globally for floating wind. Looking at the analysis and statistics, the potential global market for floating offshore wind could be twice as large as the market for fixed bottom. As the UK, we absolutely need to capture that.

Coming to your point around the CfD, the Government are currently consulting and have just closed the consultation on changes to the CfD mechanism. As I am sure you will be aware, the Government set the target for 40 gigawatts of offshore wind by 2030 and to enable new floating offshore windfarms. We would like to see changes to the Contracts for Difference model in order to enable floating wind. The current proposal on the table is to move the pot structure around to make that happen, but if the Government are serious about capitalising

on their commitment, then they need to look at how the auction parameters in the CfD can be adjusted to make that happen.

The other thing, because we cannot just rely on the CfD as the mechanism to bring forward this opportunity, is that they also need to look at strategic investment in port infrastructure. This will be something that is obviously close to your heart.

Ian Levy: Absolutely. Definitely, yes.

Rebecca Williams: Very much so, but we currently do not have sufficient capacity for deep water ports in the UK. In order to make the most of that opportunity, what we need to see is targeted Government support for port infrastructure to enable our great ports in this country to upscale so they can meet this challenge. If you look at other countries who are also in this race for floating wind, France are positioning themselves in there and other European countries like the Netherlands and Germany are, too. The regional government have just invested a lot of money in port infrastructure in the Occitanie region of south-west France.

If you are a vessel, there is not that much difference in terms of mileage whether you want to use a UK port or a port in northern France. If the UK Government are serious about capitalising on this opportunity—and we very much think they should be because of the massive economic benefits, the transition of skilled workers from other sectors and bringing benefits around the UK—they also need to look at those strategic investments in port infrastructure.

Ian Levy: That is lovely. That is very helpful, thank you very much.

Rebecca Williams: No problem.

Q15 **Chair:** Can I just pick up on that, Rebecca? What facilities are required to secure the business and ensure the success of port infrastructure? What are you talking about? Is it grid connection? Is it servicing of vessels? What is going to be done in these ports?

Rebecca Williams: We need to see the ports upscaled so they can take much larger turbine blades and operate in deeper water. Andrew mentioned the 15 megawatt turbines, which are now becoming a reality from a number of suppliers. We need to make sure the ports are equipped to be able to deal with those bigger turbine blades, but we also need to make sure they are equipped to be able to do things like quayside assembly and some sorts of quayside fabrication to enable them to deal with that bigger infrastructure. I do not know whether Andrew and Benj want to pass on anything from their own experience.

Benj Sykes: I would certainly echo what Rebecca said. The important thing around port infrastructure is that it does not just need to be connected to the sea; it needs to be connected to the rest of the country as well. The landside infrastructure, whether that is road, rail or

preferably both, is important. A lot of what goes on in the port is, of course, shipborne, but what we would like to see is ports that are large enough in terms of hinterland so that we can see the supply chain grow.

Britain is great at entrepreneurial growth. If the small and medium technology-led enterprises that Andrew is working can have the space to develop and cluster around one of these ports where the preassembly and logistics are based, that will offer a much bigger opportunity than solely ships coming in and out with components. The inward infrastructure, particularly transport and logistics, but also the scale to accommodate not just lay-down and assembly but to build up a supply chain that can grow around that activity, as we have seen in continental European ports, is important

Q16 **Chair:** Is the scale similar to that deployed in oil and gas? Aberdeen, for example, became a major centre for offshore oil rigs for a number of reasons, but they had the port facility there. Is that the sort of scale you are talking about, or is this something of a different magnitude?

Benj Sykes: Potentially bigger. If you look at Green Port Hull in the Humber, which is where we have just built our 1 gigawatt-plus windfarm and are building another one now, we see that that very quickly fills up if you have these very large turbines, the towers, the blades. You need a lot of space, and if you add on the infrastructure of the supporting supply chain tiers, we need something that is ambitious in terms of size. If you look at the traditional fabrication areas around Inverness and on the Forth, that is the kind of scale we are talking about, but we want to make sure that we do not undersize this. One thing that continually catches us out is that everything keeps getting bigger.

Q17 **Feryal Clark:** My question touches on an earlier question. Andrew, how is the Catapult supporting the material innovation behind the next generation of large-blade structures?

Andrew Jamieson: As I mentioned, we are working with GE Renewable on the commercialisation of their new turbines. In Blyth, for example, we have the world's biggest testing facility for offshore wind blades that is commercially available with open access, so we can physically test blades up to 100 metres long, which is bigger than the wingspan of an Airbus 380, for example. Through various modifications, we are currently testing a blade that in full length is 107 metres long, but we have had to take the tip off it, so they are colossal structures. Within all of that, there are lots of prospects for new materials, new ways of construction, new methodology and so on.

We are working both with the blade manufacturers and with other aspects of life, including our cousins in the High Value Manufacturing Catapult, to look at what is the turbine of the future, particularly as we think about scaling up to things like 20 megawatts. We will need all sorts of new ways of doing things, as opposed to just trying to keep repeating what we have been doing today. To me that says new materials and new

methodologies, and that in itself has a lot of UK technical and research capabilities through our university infrastructure. Of course I am thinking very closely about the aerospace sector because, ultimately, these things are not too different in terms of scale and clearly in terms of aerodynamics and understanding how these things will perform. I think the UK has ample opportunities.

To answer your question, we are very deeply involved in a number of research projects, working with lots of different stakeholders and partners, looking at what is the turbine of the future and how we can bring as much of the manufacturing and, importantly, the IP of all of that into the UK.

Q18 **Feryal Clark:** Benj, how can new technology reduce operational and maintenance cost? What barriers are there to the use of big data and AI, and how might the Government help to remove them?

Benj Sykes: Sorry, there was a bit of cut across. Is your question about the use of big data in operations?

Feryal Clark: Yes, and about the use of new technologies to reduce operational and maintenance costs, since we are talking about such large structures.

Benj Sykes: There is huge potential. We talked earlier about cost reduction potential—I think Duncan raised that—and there is still significant potential for cost reduction in the operations and maintenance phase. Of course, as these windfarms operate longer, 30-plus years, we know that that is a significant portion of the overall cost of the electricity that we deliver to the grid. We are already moving to new technology. We have just started working with a great company in Scotland that has developed a new way to get people safely on to the turbines right out in the middle of the ocean. Those kinds of things improve safety and reduce costs, and there is huge potential for operations and maintenance to find new technology right across the spectrum, from how we get to the windfarms through to smart scheduling.

Big data is proving, certainly for my company, hugely valuable. Just as one example, we have gone from routine servicing to condition-based servicing. We have learned how to understand the huge amount of data that we now get from the windfarms in real time. We get really good data to tell us what needs to be done and when. That helps us reduce costs and avoid unnecessary maintenance, but it also makes sure that we have extremely high availability of the plant. There is a lot of potential for cost reduction through more data and, more generally, through driving the technology piece that the growth partnership, which came out of the sector deal, will deliver.

Q19 **Feryal Clark:** Are there any barriers to the use of big data and AI?

Benj Sykes: Maybe I could refer to Andrew on that one, because I know he is doing a lot on big data.

Andrew Jamieson: It is a fascinating space, big data, because it is a game-changing and revolutionising technology route for all of us. Quite often the barrier is simply the realisation by the participants of what to do with this data, because it is very natural to say, "It is my data. No one else should be getting a look at it in case they give away any commercial confidentialities." We have recognised this for a long time. One of the key barriers to innovation is to understand, when we are talking about intellectual protocol, where does it truly begin and end and where can people be more comfortable with it. Clearly they need to look after their IP, but there are peripheries where it would be more beneficial to bring in other players—I was mentioning the academic community—to analyse this data and to find new products and services that come out of it.

My Catapult is setting up an operations and maintenance centre of excellence based in Grimsby to do all of this. How can we work collaboratively with some highly competitive businesses, such as Benj's, to look at how we can bring better services in O&M through more analysed data, but also driving products forward, such as the robotics and autonomous vessels to do repairs in this subject space? It clearly has lots of data and digital. How do we do this? When do we send vessels out to do things? What degree of physical human intervention is required in all of these things? Competition has been tremendous in our sector for cost reduction. There is a role to be played in collaboration as well. That is what my Catapult is trying to drive.

One final point: there are nine Catapults in the UK serving different sectors, and some of them are very theme-specific rather than single technology-specific. We all recognise that this subject of data is a game changer for stronger collaboration and analysing what is wrong and how we can solve problems and take things forward, but it tends to keep people in silos because they do not know the importance of it or the value of it, so it is easier to just hold on to it. We are trying to tease that out through innovative processes and projects.

Q20 **Feryal Clark:** Finally, the sector utilises critical materials in turbines. How is it ensuring that these are recovered, particularly from turbine blades, and used so that resource insecurity does not inhibit growth of the sector?

Benj Sykes: To put it in context, about 85% to 90% of a windfarm is recyclable, and that is what we will do as and when we come to the end of a windfarm's life. The challenge, as I am sure you are aware, is the composite blades. There is a lot of work going on at the moment, not just in our sector but across the whole composite user universe, if you like—that is onshore wind, but also many other sectors that are using composites—to look at how we can do that. We do not underestimate that challenge, and we are very much working with the Catapult and other parts of Government infrastructure to look at how we can repurpose or recycle those parts of the windfarm that are not so easily redeployed. Clearly a lot of it, the steel, the other metals, the concrete

and so on, can all be recycled. Andrew, do you want to add to that? I know you are doing some work on blades.

Andrew Jamieson: Not to counter it, but certainly to echo that it needs to be done. You can see ways forward and parties getting involved with doing all of this, but I think it is fair to say that there is a lot more work to be done to ensure that we are doing everything we can towards zero waste and the sustainability of the product.

Benj Sykes: It is about how we make sure that we are efficient in our use of resources, but that also includes where we get the resources from in the first place. We know offshore wind is using, for example, rare earth metals in the turbines, and we in Ørsted are doing a lot of work to make sure that our supply chains are both environmentally responsible and ethically responsible from a modern slavery perspective. We know some of the materials we use come from parts of the world where standards need to be very closely scrutinised, and we are working hard to make sure we achieve that. We are aiming to have our entire business carbon neutral by 2040, our entire supply chain decarbonised, while also making sure it is sustainable as well as decarbonised. We very much hope the rest of the industry will follow us in that endeavour.

Rebecca Williams: To circle back to where we started on this set of questions, improving the O&M function can obviously help the longevity of a site. By improving the O&M function and by using big data, we can also make sure that we are using assets for longer so that we are getting more value out of those assets, too.

Q21 **Feryal Clark:** Just for anyone watching this at the moment, can you tell us what material the turbine blades are made of?

Benj Sykes: Principally our turbine blades are made of balsawood, fibreglass and resin, potentially with some more advanced materials like carbon fibre. These are extremely sophisticated but, in material terms, relatively straightforward in terms of components. Clearly composites are a very exciting area. We are already talking about blades over 100 metres long and, as they get bigger, we will obviously be exploiting any opportunities to bring in new composite material that are both lighter and more fit for the service they are going to go through, but also recyclable.

Q22 **Caroline Lucas:** If the offshore wind sector is going to make the biggest contribution it can to the green recovery, then clearly there need to be more synergies with UK supply chains. Andrew, how is the Catapult working to increase the UK content of the supply chain and to support the development of UK intellectual property? I know there is quite a lot of concern, for example, that the Moray East offshore windfarm is quite dependent on the United Arab Emirates for some of its components; similarly, the farm off Fife is dependent on imports from Indonesia. How do we try to make this more of a virtuous circle so that we are keeping more of the value here in the UK?

Andrew Jamieson: Absolutely. My Catapult and my colleagues are very firmly focused that what we need to achieve, in addition to keeping down the cost, is far more UK content with the UK IP that is associated with it. Since its inception my Catapult has been doing that, helping industry on how to reduce costs and on things like introducing new players into the market, while helping existing players become more efficient and, indeed, capturing more IP. Since the start of the Catapult, we have supported well over 800 SMEs, with very direct intervention with just under 200 of them, to bring new products to bear in the market.

It is a difficult market because everything is big, as we talked about earlier in this meeting. The barriers to entry can sometimes be quite expensive, but the Catapult has played a very strong role in both the formulation and now the execution of a sector deal. One of the big initiatives that came out of that is an initiative called the Offshore Wind Growth Partnership, which is £100 million of industry-funded money. There is no public sector money in it yet, but I would like to see the public sector match it, if possible. That is over 10 years, so it is £10 million a year, and my Catapult has been given the honour of running that programme.

Again, we are aiming firmly at SMEs and new entrants into this market but, as I mentioned, we are also designing projects towards some of the bigger players who are not in the offshore wind sector, such as the oil and gas, aerospace and automotive industries. How can we help lower the barriers to entry for those kinds of businesses to come into a very green industry, which is obviously good for us all around? In addition to that is the deep research that we do, both within the Catapult but especially with our academic hub partners—the University of Sheffield, the University of Strathclyde, the University of Bristol in particular—on blade materials and ways forward and so on. We are absolutely determined that we bring the very best of our academic research to the forefront of all of this, as it can make a big difference to industry so that we can capture all the value out of that, too.

Q23 **Caroline Lucas:** As I understand it, the industry is currently at around 50% in terms of UK content and the aspiration is to get to 60%. That still does not sound all that ambitious to me. I just wondered, maybe coming to Rebecca, what you think about the ambition of a 60% UK content target, whether you think that is ambitious enough and, in particular, what more you think could be done to encourage small and medium-sized enterprises to get involved.

Rebecca Williams: In the industry, we absolutely want to maximise UK content and we want to be able to see a lot of growth in the UK supply chain. I was talking before about the role we believe the UK supply chain can play in a green economic recovery via this sector. I have already touched on some of the strategic co-investments that we would need in issues like port infrastructure, because it is not just the case that when you invest in the port that that is it. When we look at those sorts of

investment, and I would also include things like manufacturing sites, you create an anchor investment, which can then help the cluster in that area.

If we take the Siemens Gamesa Hull factory, for instance, it provides 1,000 direct jobs at the factory but, looking at what has been achieved in that community more widely, there has been a 10% increase in GVA. There has also been a 60% reduction in employment benefit paid out in that area, and there has also been a 13% boost to employment in general across the Hull region, so you can see the impact that an anchor investment can make in the local community.

Coming to your point around SMEs, this comes back to my point around needing a much more strategic approach to this, and not just relying on the Contracts for Difference model to bring this forward. We have not in the UK been as good at capitalising on the R&D investment we have put in. If you look at that compared with other European countries, Government funding for R&D is behind what we see in countries such as Germany, France, Japan, et cetera. What we would like to see going forward, and I think COP provides a really good opportunity for this, is to provide export support for SMEs, and that should be targeted using DIT, to enable the link-up between exports from low-carbon products and services in the UK with countries that we want to partner with for international climate diplomacy reasons. That is one thing the Government could do today to improve that.

Secondly, we also need to look more closely at investment support packages for SMEs, which would include financial de-risking, because as has already been mentioned, barriers to entry can be significant. What we would like to see there is the Government providing a much more strategic and co-ordinated approach to providing that support to de-risk the finances for SMEs so we can make the most of that.

Q24 **Caroline Lucas:** Do you think we specifically need a Government innovation programme, then? I come back to this issue of the 60% target, which to me does not feel that ambitious.

Rebecca Williams: I can pass over to Benj, as he leads the OWIC process, but on your point around investment, I think we need a much greater strategic approach. At the moment it has been industry funded via the Offshore Wind Growth Partnership, which has been driving supply chain growth, also with the visibility of the Contracts for Difference model et cetera, but especially as we upscale the industry and as we want to go further and faster in reaching those higher levels of deployment, we need a different approach.

Benj Sykes: I would echo what Rebecca said about the need for a partnership approach to supporting technology-led business, SMEs in particular, into our supply chain. I would probably say 60% is pretty ambitious and very challenging, very stretching, and we will need to work very closely, not just as an industry, but in partnership with Government

to unlock the cornerstone investments, and inward investments in particular, that will unlock that.

The other point that is important to make is, because of the success of the industry in getting costs down to the point where the cost of the CfDs is below the future cost of electricity, so they are delivering electricity at below market price, as forecast by BEIS, this is an industry that is going global quickly and I think we will miss a trick in a number of ways if we do not focus on the export opportunities. We talked previously about the UK aiming to get 75 or maybe 100 gigawatts by 2050. Globally, offshore wind is going to be at least 1,000 gigawatts, and possibly one and a half times that.

The prize is to deliver highly competitive technology-led businesses that can take their goods and services to that global market. In the company, we are already doing that in terms of taking the supply chain we have developed here in the UK and working with them in Taiwan, in the US and in other parts of Europe, so we are very much exporting our partner supply companies already, but we need a lot more of that.

Q25 **Caroline Lucas:** I can see the point about exporting services and so forth, but it seems a bit ironic to be positioning this to be in the forefront of a green recovery, but then also being dependent on very heavy materials being transported thousands and thousands of miles to make this work. Andrew is getting excited.

Andrew Jamieson: We probably need a few kickers into the industry and into the stakeholder landscape to achieve what we are all looking to do. The industry is very cautious in its way forward on local content, because largely the development element of the sector—the generators, ultimately—are being asked to fund much more fundamental supply chain and infrastructure issues. To my mind, and I am completely independent from these businesses, it is not what they are about. We would not expect an airline like easyJet to be building aeroplanes; somebody else builds the aeroplanes. It is no different from us.

There is now an opportunity to re-evaluate what the UK could and should be doing. For example, when we look at the very heavy elements of our industry, such as foundation manufacturing, there are lots of voices saying, "Oh no, we are not a manufacturing country anymore. We will not compete with countries overseas, so let's not bother." The point I made earlier is that 10 to 15 years ag, none of us imagined just how well we would be doing in this sector and, indeed, what we could be achieving in manufacturing. From setting up the Catapult in 2013 or so, I have seen what other countries have been able to do more readily. When we set up the Offshore Wind Catapult, we always thought, "We will never catch up with the level of intelligence of so and so over in Europe" and we are absolutely on a par with these people now. We are working very closely and collaboratively, and that is a positive.

There is an opportunity to re-examine what we could be doing on the manufacturing front, but I want to make it clear that we cannot just ask the development community to enable all of that. These are hundreds of millions of pounds' worth of investment collectively, and we need to decide what we need to be doing around our infrastructure to enable all these things to happen. As a very simple case in point here, you can see the demand in terms of targets that we are all looking for from net zero. It is not matched by aggressive supply chain growth. The supply chain clearly sees risks and barriers. Those are the things we need to identify and tackle together in order to make us successful and have much more resilience in our manufacturing in the UK.

Chair: That is an important point you have made there, Andrew, and it is precisely why this inquiry is so timely and relevant. There is an opportunity for the UK to grasp if we set about it properly, remove the barriers and invest as we need to in the technology to maintain global leadership. It is with that export opportunity in mind that I think Claudia Webbe is going to ask the next set of questions.

Q26 **Claudia Webbe:** Mr Sykes, can you start by explaining the scale, extent and nature of the floating offshore wind industry? In particular, and this is the substantial question, if the UK is currently the world leader at floating offshore wind, how can it maintain this position and market the opportunity abroad?

Benj Sykes: That is a good question and it follows on well from what we talked about just now, the opportunity around the green recovery, because floating is still in its early stages. We have six turbines on floating foundations in the UK, compared with roughly 2,000 turbines fixed to the seabed, so that gives you a sense of the lag between the floating and the bottom-fixed technologies. But as I said before, I believe our heritage in oil and gas, particularly deeper water oil and gas, gives us an opportunity to get into the floating technology ahead of others. Because we have a combination of that sort of oil and gas experience and knowledge, plus a deep knowledge of offshore wind more generally because we have built coming on for 10 gigawatts, it puts us in a great place, but that is not going to happen without some partnering with Government.

We have talked about the need to deploy. If there is one thing that has resulted in the extraordinary cost reduction in bottom-fixed wind over the last 15 years, it is reliable and continuous Government policy supporting offshore wind, which has meant companies like mine have been confident to invest and drive innovation. We have invested £10 billion ourselves alone in the UK in offshore wind, but that has only been possible because we have had the renewables obligation and then the Contracts for Difference. We have had all the main parties continuously and repeatedly saying the same things about the importance of this technology and the fact it is going to be supported. These projects are on a 10-year cycle from start to build, so that is only going to work if we can maintain this momentum through clear policy. That is one piece.

The other thing is that deployment is what drives this, and we need to combine the innovation work that Andrew has talked about and the partnering with Government through the growth partnership and other mechanisms to invest in the capability and the infrastructure, but we also need to make sure we have the pathways to deploy because, in the end, you learn by doing and the demand that comes from a clear pipeline is what will drive innovation in manufacturing. As Rebecca said earlier, the consultation that has just closed, looking at a separate Contract for Difference pot for floating wind in the next auction round, will be an absolutely critical signal to our industry on whether the UK wants to be a leader in floating wind.

Q27 **Claudia Webbe:** Could I maybe expand that and ask a question of you all? How else could the sector look to increase exports, and which markets should the UK focus on?

Benj Sykes: As I mentioned earlier, we are already exporting quite a lot of our UK supply chain and they are, without exception, technology-led businesses. Just as a little aside, in my time in the oil and gas industry I saw the flourishing of those technology-led business not just from the north-east of Scotland, where I was living, but across the UK to the point where, wherever you see subsea oil and gas anywhere in the world, you will hear UK voices and Aberdeen accents. That is what I would love to see in our industry, that we have Grimsby accents—and others as well, but particularly Grimsby ones because that is where we are based—around the world wherever there is offshore wind. That capability, the technology and the kit that comes with it is hugely exportable. Working with DIT, but also working with Innovate UK and the Catapult, to drive the creation of UK intellectual property that can then be exported has to be the key to unlock exports, in my opinion. I am sure Andrew will contradict me, though.

Rebecca Williams: Sorry, Andrew, I will just butt in there. I would absolutely echo what Benj has said. I return to my earlier point, there is an opportunity now with COP next year for the UK to grab this and run with it, and to integrate it into climate diplomacy with the support of DIT, because that is what we need to see to enable those businesses to further export.

To pick up on Benj's point, yes, we have a very proud history in the industry of UK supply chain stalwarts exporting their skills and expertise around the world. I will just namedrop a few of those important supply chain companies. We have JDR Cables in the north-east of England, which is exporting its skills and expertise around the world; and James Fisher, which comes from an oil and gas background, has now transitioned and is also exporting its skills and expertise globally. It is how we can also support all the other SMEs in the supply chain to make the most of those export opportunities. There is a real opportunity to do this now, which would help not only maximise the competitiveness of

those businesses, but would also help seize the floating wind prize and aid us in our green economic recovery.

Andrew Jamieson: Again, my Catapult in very interested in the economic opportunity for the UK. We have forecasted that we could have up to 16 gigawatts of floating wind by 2050 if we line all our ducks in a row towards all of that. That will need significant Government intervention and leadership across the industry to make that happen.

Benj made the point quite clearly that, with the competitivity of everything else that is going on, we need to be unimpeded around all of this, which is good for the consumer because it ensures lower cost. If we want to be making strategic investments and initiatives, we need to be making them now. We estimate that maybe £150 million or so of public funding—not all necessarily from one source, but collectively—is probably the kind of kick starter that is needed to drive and make sure that we capture all of the elements in the UK.

On the export opportunity side, I think my colleagues have answered well. Operations and maintenance is going to be a huge industry for the UK. A lot of that is going to be robotics and autonomous systems, the kinds of companies that can send underwater submersible vehicles out to fix things, not just to survey things but to fix them and make repairs. Clearly that, as a service, has lots of opportunity for other marine users such as the oil and gas industry, and so on. Therefore it is absolutely within our vision that we see the UK is able to capture the equivalent of what Aberdeen has had in Scotland, for example, in oil and gas where it now exports services all around the globe, which can be anything from advice on operations and maintenance through to helping businesses in whatever country set up facilities to be doing what they need to do in terms of manufacturing and servicing over there. That is absolutely within our grasp in the UK.

One final point on floating wind that I meant to mention earlier is that the Scottish offshore wind round is looking at considerably deeper water than is typical elsewhere in the UK. The Welsh Assembly Government is also looking at the potential for floating wind. I think there is a collective need for us all to get together and make the right decisions because we are absolutely sure in terms of manufacturing and design, and certainly cross-sector working with aerospace, oil and gas and so on, that there are huge economic opportunities for us to be grasping.

Q28 **Claudia Webbe:** Benj has already indicated this but, just to be clear, what is the nature of the Government support that is needed to increase the export value of the sector?

Benj Sykes: I am going to defer to Rebecca, because I know the renewables trade association has done a lot of work on this. I will give her the airtime.

Rebecca Williams: To sum up, it is learning by doing through the CSE, deploying floating wind through the CSE and, as Andrew was saying, getting that framework in place now for floating wind to be able to play its part later in this decade and also give the supply chain the confidence to invest.

In terms of the export piece specifically, it is around that targeted support that I mentioned before with DIT officials more empowered to be able to link up, to form partnerships ahead of COP with SMEs in the UK in a more kind of strategic way. That is what we would like to see going forward. I think it is a combination of those factors that will really help us upscale exports in the UK.

Benj Sykes: Very quickly, as a final comment, we have a head start on other countries but not in the way that we did on bottom-fixed wind, so we need to get our skates on. We need to get moving or we will be seeing other countries' goods and services coming our way. I think the way we get moving quickly is to figure out very quickly what we can be good at, what we can be world leading at; not try to do everything but figure out those bits of a floating offshore windfarm where we have natural capability and leadership and build on those.

Q29 **Chair:** Rebecca, you referred to the need for DIT to get more engaged in this sector. Can you elaborate on that for a second?

Rebecca Williams: I think DIT needs more resource to be able to run with this in the way we see in other countries. To give an international example, the Danish framework of how they support companies within Denmark to export is best in class, and we would like to see a system that is more akin to the Danish way of supporting companies that want to export. To unpack that further, the opportunity is really there with COP next year to put a new system in place to maximise on that opportunity.

Q30 **Chair:** What do the Danes do that we do not do?

Rebecca Williams: They have a much more co-ordinated team looking at this. They have a team that considers different aspects of how you could support businesses in this low-carbon environment. That is things like financial de-risking, which I mentioned, and co-investment, but it also then looks at targeted export support, having that one-to-one contact with an official who you would be able to rely upon who will then help and aid you in forming those introductions is the way they do it. The UK Government has been good at doing that, but we need to be better if we are going to maximise this opportunity.

Chair: This Committee has been very critical of the UK export finance focus on fossil fuel projects to the exclusion of hardly any renewable projects internationally, so that is something we should pick up with them.

Q31 **Dr Matthew Offord:** I wanted to ask Mr Sykes, in particular, about the considerations around the designation of sites and their environmental

impacts. Are there are any areas where you have particular problems, such as marine protected areas for example?

Benj Sykes: It is a really important point you are raising. We know that particularly the North Sea, but all the UK exclusive economic zone, is a very busy place with human activity and is also teeming with marine life that we need to protect. I have just finished advising DEFRA on how you protect marine areas, and I hope you will see more about that next week in the introduction of highly-protected areas within the UK EZ.

There is no doubt there are areas where it is very challenging for human activity to co-exist with the natural environment. We are very aware as an industry that we need to be responsible and sustainable in how we build out offshore wind. We are already, I think, under some of the strongest regulations in terms of the Habitats Regulations and other regulations that we have imported from our days as part of the European Union. Those are very robust, and they certainly make sure that we are challenged and make sure that we do find the right place to build windfarms.

If we look forward and talk about the 50, 75 or more gigawatts that we will need to build to get to net zero by 2050, particularly if we go with renewable hydrogen as a key energy source, we are going to have to work much more strategically to deliver the spatial planning that is needed to make sure that we can put the offshore windfarms in the right place, connect them in the right way, make sure that we deliver marine protection and absolutely make sure that the ecosystems that are under threat of climate change, which we are seeking to protect, do not get unduly damaged in the process. Also, of course, there are other activities such as fishing to which we also need to take due regard of their environmental impacts. Therefore, it is a complicated picture.

One of the things I am very aware of—I do a lot of work on this at the moment with BEIS and with DEFRA in particular—is to see more working across Government to solve some of these questions. If I look at spatial planning, for example, we really need a strategic approach that brings in, for the marine space, DEFRA and BEIS, but then for the onshore piece you have MHCLG, the Department for Transport for shipping and the Ministry of Defence for radar issues. There are many different Government Departments that need to work closely together, and we do not have a lot of time to get this on a more strategic footing so I think that is something we really do need to see.

We heard before the pandemic about the need for joined-up government to deliver net zero. This is one area where we really need to get on and find that cross-Government collaboration and that one voice towards how we hit net zero in a sustainable, environmentally responsible way.

Q32 **Dr Matthew Offord:** That is really helpful. Do you find the environmental restrictions too restrictive upon your work and your locations?

Benj Sykes: One of the challenges we face is the precautionary principle. I know there are going to be questions around whether we have enough data to understand what our impacts are. I think we do. I think there is more work we need to do, though. It is already starting between Government, industry and also, if you like, the landlord, the Crown Estate, to put all these pieces together and build that strategic picture particularly around birdlife, what is going on and where are the right places to put windfarms in the context of the macro view rather than the individual project view.

One of the concerns I have is that, as we take quite a project-level approach to environmental management, we end up with a patchwork of development and we end up with a very inefficient use of the sea, both for offshore wind and also for marine protection. A more strategic approach would give us a great opportunity to make the most of this fabulous wind resource and also the marine ecosystems that we want to preserve.

Q33 **Dr Matthew Offord:** I was interested in the conversation earlier about the removal of any associated works. You mentioned there the precautionary principle but there is also the polluter pays principle. In your understanding, would any effects or any mechanisms from these products be removed completely from the seabed?

Benj Sykes: I think it is the OSPAR regulations where everything has to come out from offshore windfarms, as anything else does. Of course our expectation is that, when the wind turbines themselves need replacing, all the electrical cabling and the offshore substation—those sorts of things—can be reused because they have a longer life than a moving part in the same way. Therefore some of that removal is a long, long way away but, yes, we are subject to the same requirements in terms of leaving the seabed as we find it, as are almost all other industries, not quite all but we will not go there. I think it is absolutely right that is the case and I think what we will also see, and we are already seeing this, is where we build windfarms—and we have seen changes in human use within those windfarms—we are starting to see some of the biodiversity gains and biodiversity benefits of offshore wind in terms of restoring some of the ecosystem that has previously been damaged.

Q34 **Dr Matthew Offord:** You are completely correct, it is a regulation under the OSPAR convention, but also that allows a clause to get out of it by saying—

Benj Sykes: Derogation.

Dr Matthew Offord: —yes, if it is reasonably practicable and also cost effective. We are seeing right now that Shell, for example, is seeking to get out of some of the Brent locations by using that defence. I presume that, because you are at a shallower depth, it would not equally apply to you.

Benj Sykes: There is nothing that we see at the moment that would cause us to go down that derogation route. We are in the business of being environmental leaders, so it is part of our natural drive to leave the place better than we find it.

Q35 **Dr Matthew Offord:** Sure, I understand in terms of fossil fuel extractors acting completely different from the way the renewable industry is, so that is welcome.

I wanted to ask Ms Williams particularly about how the offshore wind sector is able to protect species. We have already mentioned fish species, birds and porpoises. There has been criticism of this kind of technology interfering with the way that animals navigate and also interfering with breeding locations and various other matters that affect the environment more than just the siting of these technologies.

Rebecca Williams: There is a lot of innovation in place to deal with some of the potential impacts. Perhaps I will defer to Benj for some real-life examples of things that Ørsted is doing.

I echo the points that Benj made around a more strategic approach. One of the major challenges that we have right now is looking at the resourcing that exists within Government and the statutory bodies to be able to do individual studies on the impacts that specific projects cause. We are seeing quite lengthy delays to some of that picture. For the industry, we absolutely want to see that process done fully, but we need to see that in a timely manner. I do not think it helps the natural environment at all either for these decisions to not be made due to inadequate resourcing at the statutory bodies. That is something the industry is absolutely prioritising.

Going back to the point Benj was making around monitoring and data, and also what the industry is doing to understand that picture a lot more widely, the Crown Estate is leading a dialogue in this area through its strategic enabling actions programme that brings together all the different stakeholders in this area—the statutory bodies as well as wildlife organisations, DEFRA and so on—to understand exactly what we all need to be able to come to a common and shared understanding of how we better use the marine space and how we deal with the potential impact. That process is going really well. I think we need to see it escalate and have more buy-in from Government and from DEFRA as well. Really it comes back to the point I was making right at the start of this session around needing that kind of roadmap from the Government to be able to really put pressure on the situation, to find a timely response and to resolve it in a timely way, otherwise we are not getting to a solution that benefits any of the parties at the moment.

Andrew Jamieson: Very simply we are in the UK, it is an island surrounded by water, and we are looking at these oceans as a strategic resource for net-zero solutions. It seems to me that we need a lot more strategic initiatives to be looking at the proper use of these oceans and

how we get the right balance between what we are trying to strike in terms of energy use and the needs of other interests, including wildlife, into the bargain. A lot more could be done and to use it as an opportunity, particularly technology development opportunities, better surveying methodologies, greater creation of databases that do not worry the practitioners about IP and competitivity but allow fuller and deeper analysis of the uses of everything from the seabed to the oceans themselves, and a wee bit of airspace above it. I might add that, again, it is a huge opportunity for working with oil and gas and other producers of energy in this space.

I do not think we are approaching it fully strategically enough, and it will need investment to do that, and out of that investment will come lots of other companies that can provide better solutions to what we are doing today. Then ultimately we allow the decision makers, including in the environmental space, to be more confident of the consenting and approval processes that go into Government to take our industries forward.

Q36 **Dr Matthew Offord:** That is really useful because it touches on my final point, which is the collaboration between yourselves as an industry and other actors—such as marine conservation organisations, charities and that kind of thing—and also regulators working in the industry. We go back to the issue of OSPAR and Brent Spar. The whole time the argument was that there was nothing existing in the deep water. There were professional witnesses on behalf of Greenpeace and others who demonstrated that there were deep-sea corals that not only thrived in that environment but were an important part of the ecosystem. There seemed to be no discussion between the industry—let us not just focus on Shell—and also some of the other actors. How do you collaborate with different organisations and interests so that you can continue with your work but ensure that they benefit from the knowledge you gather as you progress this?

Benj Sykes: That is a really fair question. I was in Shell at the time of Brent Spar, so I remember it extremely well. One of the work streams that has come out of the sector deal is called Barriers to Growth, and I am responsible overall for that work stream. We are working not just with BEIS and DEFRA but also with the Wildlife Trusts, the RSPB and also, of course, closely with the arm's length bodies of DEFRA, the regulators like the MMO, and also bodies like Natural England. We have brought that ecosystem together, as has the Crown Estate as landlord. I think we have created the right forum for that collaboration to find solutions together.

There is no doubt that we need to see more resourcing, and Rebecca talked about that. The arm's length bodies are, in my view, woefully under resourced for the scale of the challenge that we face to get to net zero, principally in offshore wind but I am sure in other areas, too. We need to put in very small amounts of money relative to the £50 billion of investment to properly resource that conversation. I think we are now

convening all those key actors in this space because we know it is not a question of us saying one thing and others saying another. We have to work together to find solutions. I have to say I have been very encouraged, particularly working with organisations like the Wildlife Trusts, on the understanding that, while we are all squabbling, the planet is warming so we better get this sorted and we better sort it quickly because otherwise the thing we are squabbling about will be gone anyway.

Q37 **Mr Robert Goodwill:** I think it is clear from what we have heard that we need more information about the effect on seabirds, and particularly the effect on cetaceans, when you are building the turbines and there is pile driving going on and that sort of thing.

As a former Fisheries Minister, I can tell you that the view of the fishing industry is that, when you build a windfarm, you are building a massive marine conservation zone where they cannot go and fish and that, in effect, it is having the same effect as some of the wrecks. Indeed, to follow on from that, could it be that leaving a bit of scrap iron on the seabed when you are finished will create natural reefs and areas where fishermen cannot maybe carry out some of the more destructive fishing methods, and therefore clearing the seabed at the end maybe would not necessarily be the best environmental thing to do?

Benj Sykes: That is a really interesting question. It is a bit early to say quite what will be the benefit, and particularly what the seabed is going to look like.

In terms of what happens when we build a windfarm now, we do a lot of work around protecting cetaceans, during installing the foundations and all the piling work. There is a lot of collaborative work across the industry, and across the world actually, on this question.

In terms of what happens once it is built, what we are seeing is little or no bottom trawling. We do have fixed-gear fishing that is allowed in the UK. Not in other countries interestingly, but in the UK fixed-gear fishing carries on and we work very closely with those interests, with the IFCAs and others, to make sure we can co-exist successfully. Because there is no bottom trawling, we start to see quite some changes in the quality of the benthos. That raises some interesting questions, perhaps for others, about the co-existence of offshore wind and marine protection. The work I have just done on highly-protected marine areas very much brought that out, we should not see all types of human use of the seas as the same.

Q38 **Mr Robert Goodwill:** Do you think maybe you are too often in defensive mode and not demonstrating enough that you are delivering carbon-free electricity?

Benj Sykes: That is a really fair challenge, and I think we probably do need to do more. I personally have been heavily criticised as the chair of the industry council for not getting out and telling our good stories about

the positive impacts we are having. Like any human activity, we know we have an impact on the environment where we operate but I think it is an opportunity to deliver biodiversity benefits. We probably need to do more but also to make more noise about the fact that we are bringing those benefits as well as low-carbon electricity. Absolutely, it is a fair challenge and I put my hand up and say, yes, we can and we will do more on that.

Chair: It is good to hear witnesses getting something of benefit out of these sessions as well as us. If you are going to be quadrupling the installations around our shorelines, you will find a lot more public interest in what is happening. Therefore getting your messages out on the benefits, or at least on reducing the harms, is really important to taking the public with you.

Q39 **Jerome Mayhew:** I am going to develop the questioning on some of the key issues preventing a rollout of more windfarm capacity. If we are going to get from whatever it is now, about 8.5 gigawatts of capacity offshore, to 40 gigawatts by 2030 then we need to remove as many of the barriers as we can while still protecting that which needs to be protected.

My first question is to Rebecca. If you identify what the main barriers to developing new offshore windfarms are currently, we can perhaps start to unpick some of those.

Rebecca Williams: Yes, do you want to go from a top-level approach?

Jerome Mayhew: Let's start there.

Rebecca Williams: They can be separated out into many of the things we have already discussed in a bit more detail. There are barriers or challenges from the point of view of the impacts on aviation and how we manage that picture. Also, as you have already touched on, we need to make sure we are deploying in harmony with nature and making sure that we develop the industry sustainably.

Another big one is obviously the grid and the way that we plug all this offshore wind into the UK. It is an absolute priority for us in the sector that we get a more sustainable and more strategic approach to that challenge, which I personally see as one that we need to tackle in a very timely fashion. I am aware that we have not really talked about that one as much as we have talked about the other barriers today. On that one specifically, the industry is investing a lot of time and expertise to try to solve this challenge at the moment, working closely with National Grid to come up with a better solution.

The barrier here really is that we have been trying to use a regime that is not fit for purpose anymore. It is not working for the industry, and we do not think it sounds like it is working for communities right now. The framework that we have has constrained us in what we can do, so we need a strategic approach to change this. We need to get Ofgem to the table so it can assess the alternatives. Then we can go forward and

unlock this barrier, making sure that we can deploy the levels of offshore wind that we need for net zero and to revitalise our economy but also in a way that is in harmony with people and communities.

Q40 **Jerome Mayhew:** Can you develop that argument a little bit further? You want to bring Ofgem to the table. Is this to allow you to share infrastructure between windfarms, to consider an offshore ring main, for example? What are the solutions the industry is putting forward that are being constrained by the regulatory framework we currently have?

Rebecca Williams: The current regulatory framework is for point-to-point connections. It is a piecemeal approach that relies on the industry trying to get greater co-operation between individual actors that are not incentivised or enabled in order to do that, basically. The industry would like to see much greater use of shared connections. I know the other day the Minister, Kwasi Kwarteng, said he would ask Ofgem to do a feasibility study of the ring main proposal. The industry absolutely welcomes that commitment to get Ofgem to look at that. The ring main is one proposal on the table and it is an interesting one. There are other solutions out there that could incentivise more shared connections, and they should be looked at as well so we get the right framework that suits both the industry and communities, and allows us to deploy this level of offshore wind.

Q41 **Jerome Mayhew:** Can I push you on that? I am very familiar with the offshore ring main, being a Norfolk MP. My constituency is currently crisscrossed with a number of connection routes that are due to cause devastation to the local environment and communities while they are being built, so I am very familiar with the offshore ring main proposal. What are the other potential solutions that you have in mind?

Rebecca Williams: We need to work with Ofgem so we can use shared connections. Being perfectly honest, one of the reasons the industry has not come out yet with full backing for the ring main proposal is that we do see some challenges to that proposal. I did some back-of-a-fag-packet maths before this meeting. If we look at the ring main, we would be connecting around 13 gigawatts, so 9 million homes, through one connection and that, from an energy security point of view, would be a challenge. That is why I say I think we should not just look at the ring main as one proposal; we should assess it alongside other ones so we can get the framework that works both for communities in north Norfolk and for the industry too, bearing in mind the need for energy security.

Q42 **Jerome Mayhew:** How quickly do you think the industry could react if Ofgem was amenable to a change in the approach of the regulators? How quickly could the industry react and start putting this new infrastructure in place?

Rebecca Williams: When we are looking at the projects we would be connecting via these connections, they are going to be deployed in quite a few years' time, so further down the line. We need a timely solution to

this challenge, because we have only so long to deploy these levels of offshore wind that we need to see. Within that paradigm, we have some time to get this right. It is key that we get this right rather than get a solution that does not, down the line, end up working for communities or for the industry.

Benj Sykes: I echo what you say. There is a real sense of urgency to find this new strategic solution. Just on the offshore ring main, I think it is great. As Rebecca said, we are equally positive about the commitment made by the Minister and about Ofgem and BEIS working together on this. Out of the sector deal we have a transmission review programme now running, and we have managed to bring the electricity system operator part of National Grid, Ofgem, BEIS, CLG and others into that conversation because we know there are many actors.

We need that solution quickly. As I mentioned earlier, it can be seven to eight or nine years from starting developing a project to constructing it and having it operational. We know there is a lag time, so we know we need to work with communities as we come through the last set of projects on the OFTO regime. To reiterate, I think we all recognise that this point-to-point regime is past its sell-by date really. Offshore wind has become much more successful and, therefore, much more prevalent and widely deployed than anyone envisaged in 2007 when this was put in place, so we need to move on. I think we need to be cognisant that there is a lot of work to be done once this new regime is in place to then develop the projects and build them against that new regime. It is important to understand that it is not going to be something that will throw a switch in 2021, for example. There are projects that have been through eight years of development, and those will continue through to construction.

In the meantime, I think we really need to pull out all the stops—I hope you are aware we are already doing that in our project—to work with communities, with stakeholders and also with other developers to find ways we can connect to the grid in the ways that are least disruptive to the communities where we are doing that. We recognise also that we need to press ahead if we are going to hit net zero, so there is this tension that we need to manage there.

Q43 **Jerome Mayhew:** In the short to medium term, if Ofgem were to allow you in the short term to share connection infrastructure, is there an opportunity for individual windfarm connections? For example, in my constituency I have two connections that are crossing over each other at Cawston, and they are not talking to each other. That seems a very, very obvious short-term solution that will probably be cheaper.

Benj Sykes: We are definitely talking to Vattenfall about that, and they are happy to carry on the conversation with my team. We are hamstrung by the regulations. This is not me in any way abdicating responsibility for what we need to do as a developer, but in the end we have to follow national legislation. That is why I am pushing to get this one changed, in

the meantime, within the bounds of that regulation. We will do what we can.

Q44 **Jerome Mayhew:** If, as politicians, we come away from this and change the regulations within, say, the next 12 months, how quickly can you on the ground reflect that change?

Benj Sykes: I am not trying to dodge the question, but we would need to have a look at what that was. As you know, both projects will hopefully have a decision on their consent applications on 1 July, it slipped again on Monday. Those projects will then be heading into an auction next year we hope, if that does not slip because of Covid. Therefore, for those projects it really depends on what the art of the possible becomes in terms of both the project timeline and any sort of flexibility that can come into the regime. However, I am very happy to explore that because we know we need to find smart ways to get around these issues wherever we can. We are acutely aware of that.

Q45 **Jerome Mayhew:** I am going to move back to Rebecca to find out a little bit more about the problems with planning offshore windfarms when we are dealing with the interference with aviation radar. You have identified what the problems are, but are there any solutions? Where do you think this should be going?

Rebecca Williams: There are definitely solutions. It is quite helpful to look at this from a principles-based approach. The industry has been working within the confines of MoD and viewing this as not a business-as-usual activity, so it is other activity. Where we need to get to is that offshore wind is factored into the business as usual of the UK. We have been doing a lot of work with the MoD on this issue through the sector deal, which has been really successful. Now the MoD has a programme by which it is looking at how it can adapt the way it does things to manage the impact of offshore wind. There are absolutely solutions on the table for offshore wind, it is just about ensuring that we have that programme of activity and that it continues in a timely way because, otherwise, the challenge is that a lot of offshore wind around the UK is impacted by this interaction with military aviation. Thankfully it is one where there is a solution, and it is in progress. We just need to make sure that progress continues.

Benj Sykes: Maybe I can add to that, because I have been quite involved in working with the MoD on this. Air defence radar is obviously critical and in the past, as an industry, we have been buying the solutions for the MoD. We need to move beyond that. What has been fantastic out of the sector deal is that we now have a level of engagement in the MoD that is fantastic. The MoD has been, until Covid, moving faster than the industry to solve this problem. We are working together on a co-funded project to find technology solutions. There is a lot of interest in the supply chain as it is another great technology opportunity for the UK to develop windfarm-proof radar for air defence. There is a global market for that, of course. It is a technology problem that we will solve. I think we have

moved beyond the barrier to solving it, which was deep engagement in the Ministry of Defence. We just need to make sure we do not lose momentum through the pandemic that obviously is a huge burden on Government right now, understandably and correctly. We want to be sure we do not slip up as there is a lot of capacity that is held back not by environmental issues but by interference with air defence radar and, of course, we all want to make sure that security is maintained.

Rebecca Williams: It is very clichéd, but in a lot of these challenges there is significant opportunity. The UK is a world leader in this industry, so we are feeling some of the effects of these challenges before other people around the world. That gives us a unique opportunity to show other countries the way in how to solve some of these challenges. Again, it is an economic opportunity for the UK if we can solve these problems in a timely manner.

Chair: As an aside, I was a Minister in the MoD five years ago when these issues were taking their time, and it was largely a result of lack of technological solutions. You are quite right to point out that not only are we leaders on the surface of the water, but we are also leaders in air defence radar development in other sectors through the MoD. I am really pleased to hear that the sector deal is helping bring about the proper solution.

Q46 **Mr Shailesh Vara:** How does offshore wind link to other industries, such as hydrogen and battery storage?

Benj Sykes: That is a really important question, and I know you will be looking at hydrogen shortly. Battery storage is an important technology in terms of maintaining grid stability. We know the characteristics of the electricity—I am not an engineer, so do not test me on this. The nature of the electricity that we produce and the way in which we produce it means that we need to provide, not as offshore wind but as a system, ancillary services that maintain the quality and reliability of the system. Battery storage is really important for that if we get significant imbalances between supply and demand.

Perhaps more importantly for me, as we build more and more offshore wind and as its cost continues to come down there are obviously times when we have more generating capacity than demand at that moment. Storage of energy on a longer timeframe than you can do with lithium-ion batteries is really important, and I think everyone is now recognising that hydrogen is going to be a principal way in which we can achieve that.

My company, and many others in the offshore wind industry and also in the supply chain, is looking very actively now at how hydrogen and the hydrogen economy, can work with the offshore wind sector to deliver renewable hydrogen, and I think that is decarbonising industry. We already have a project working with Phillips 66 in the Humber to develop a concept for them to get renewable hydrogen for their chemical plant,

for example. Also for heavy transport—whether that is shipping, trains or buses—we know hydrogen fuel cells are a great solution.

We also know the biggest battery in the country is the gas network. You can store a lot of energy in the gas network. If we can start to put some hydrogen in there, it is a great place to store energy that we are creating in offshore windfarms at times when it is not needed immediately. There is a huge opportunity for the country to be a leader in the use of hydrogen together with renewable generation to produce renewable hydrogen. That can be turned into ammonia, which is, for example, potentially great fuel for shipping. There are many ways in which hydrogen can unlock decarbonising industry, decarbonising domestic and industrial heat and other things as well.

It is a really exciting opportunity that creates, again, opportunities. We have a company, ITM Power, which produces state-of-the-art electrolysers. We are working with it to scale those up so we can use offshore wind to produce renewable hydrogen with its electrolysers. I think it is a really important point. It is early days, but there is a lot of opportunity there.

Andrew Jamieson: The Offshore Renewable Energy Catapult is deeply involved with the way offshore wind is going to play a leading role in cleaner energy from other sources, especially hydrogen, in the future. For example, we have a £4 million research project under way in Milford Haven, working with oil and gas companies and local bodies around there, on exactly this. What does it mean for the oil and gas industry that is based around there? How can we use clean wind resources, for example, to increase the use of electrolysers to provide new, very sustainable and environmentally friendly fuels both for transport and for heating?

We are also working very closely with the Oil and Gas Technology Centre based in Aberdeen. It is one of the principal innovation players for oil and gas. Likewise, we are looking at how that industry can decarbonise even its operations to extract oil and gas using wind power as a clean source of fuel. Floating wind lends a strong hand into all of that. Clearly its journey is to think about the end use of that product, which is leading to more carbon storage and the production, potentially, of hydrogen, as Benj has talked about as well.

Finally, I would like to advise the Committee that, as I mentioned, there are nine Catapults. My dear colleagues in the Energy Systems Catapult are leading a very big project across us all to see what we can do collectively over the next year in this space, and clearly hydrogen has a big function to play in that. That is across manufacturing technologies through the High Value Manufacturing Centre. It is looking at the Connected Places Catapult, which is going to look at the use of, for example, hydrogen as heat in the home. It brings in even things like the Satellite Applications Catapult and compound semiconducters for

processing industries. All of that is aimed at how we capture economic value in the UK. We clearly hope to be bringing more details of what we are looking to do to Government in the early part of the summer.

Q47 **Mr Shailesh Vara:** Mr Jamieson, in terms of linking offshore wind and hydrogen, is there anything you feel specifically the Government should be doing? You referred to Government just then, but is there anything you feel they ought to be doing to facilitate this?

Andrew Jamieson: That is a very good question. My personal view is that other countries are perhaps getting ahead of the UK in the hydrogen production space. We have lots of good projects in the UK, and I am not being critical of it, but we need really big game-changing demonstration projects that show that these technologies can bind together in terms of the different industries that come together and that there is an economic future. We should not be doing it with lack of scale; I think a big world-class demonstration is the way forward. There is a big call for Government to lend a hand towards all of that.

Rebecca Williams: There has been a lot of focus from the Government so far on blue hydrogen. While that is important, I want to lay a marker down that hopefully we have given you all a flavour today of how quickly the offshore wind sector has revolutionised the UK energy system. I would not want to bet against us in terms of the innovation we can bring forward in a very short space of time. While there has been a lot of focus on blue hydrogen, and that seems to be where the Government has placed the most focus to date, the opportunity for renewable hydrogen is huge. Certainly from my position looking across industry, I think all our members are extremely bullish about what they think they can do with the cost of renewable hydrogen. It really is a huge opportunity, and one where we will see a lot of innovation going forward.

In terms of what the Government could do, as I said, there has been a lot of emphasis placed on the role of blue hydrogen. We need to see the Government look at the opportunity for renewable hydrogen and take that forward by a roadmap and by demonstration projects, as Andrew was saying. That is something we are hoping to work with them on, especially because—coming back to the green economic recovery point—there is a chance here to put in place a framework that can really make sure we capitalise on that opportunity in a really timely fashion.

Benj Sykes: To add to that very briefly, I do believe, and there is independent verification, that renewable hydrogen will be at or below the cost of blue hydrogen within a decade.

Rebecca Williams: Yes.

Benj Sykes: There are some very specific asks that low-carbon hydrogen needs in general around the use of electricity and the way in which electricity gets charged in order to get to the point where it is turned into

hydrogen that needs to be tackled. It is quite technical, but that does need to be addressed.

The thing Government could really do, for the hydrogen economy generally, is to stimulate demand. Ultimately whether that is heat, whether that is industrial process or whether that is heavy transport, creating the market through those signals with policy is vital. We can generate hydrogen that will be super cheap super soon, but if nobody wants it there is not much point.

Mr Shailesh Vara: Thank you very much. Mr Chairman, my third question has already been covered, so I am happy to leave it at that.

Q48 **Mr Robert Goodwill:** Following on from what we have just heard, I think we heard at the start that, by 2050, we could have 75 gigawatts of electricity being produced, which will be around about 59%. Does that factor in a massive switch from, say, natural gas to hydrogen produced from electricity, or the fact that every car in the country is electric? Are those figures based on projections for increased electricity use or based on the mix we have at the moment?

Rebecca Williams: It is based, in the first instance, on the Committee on Climate Change's scenarios for net zero, which it put out last year. I believe it is going to update its power sector scenario this year to look at net zero. It should be able to give us more focus on exactly what its assumptions are through that process.

RenewableUK published a report last week on our vision from our members of how they see the future. We see 75 gigawatts as a lower limit in terms of ambition of what the sector can achieve. At the beginning I was talking about how we see the opportunity for offshore wind from 76 to 92 gigawatts. The reason for that range is precisely as Benj was saying, some of it depends on the demand signals that we see for hydrogen. There is obviously a sliding scale of how much it is used in the provision of heat for people's homes through to heavy industry, and also looking at electric vehicles and what assumptions you make about the speed of the transition in electric vehicles as well. Essentially, we can build more offshore wind. As Benj was saying, we need a market for that and demand to pull it through. Certainly we see significant decarbonisation of those sectors through electrification and through hydrogen production.

If you want the specific assumptions that rest behind that analysis, I am very happy to share them with you.

Q49 **Mr Robert Goodwill:** It might be helpful if we had a ballpark figure. Are we looking at a doubling, tripling or quadrupling of demand for electricity for use directly or for producing hydrogen?

The other point that I think will be interesting is at what percentage of wind generation we become vulnerable to the situation where it is the middle of the night, there is no photovoltaic and we do not have a lot of

isobars around. What is the maximum level of wind we can risk having without maybe having power outages?

Rebecca Williams: On the demand one I will have to come back to you, because I am not sure off the top of my head and it depends which scenario you look at—there are different ways of doing it. I will come back to you with some figures on that one.

In terms of the penetration of renewables and how we manage that, we have explained that, through battery storage and through the production of hydrogen, we are looking at very high levels of renewable penetration. However, we do not see that as an issue because we do have the solutions in place to enable us to do that. The products and the services offered by National Grid are helping already to balance the grid using renewables. For instance, a couple of weekends ago there was a new tool used by National Grid through which renewables basically played a very strong part in helping balance the grid during this period of low demand. We have all the solutions there.

I do not necessarily think there is an upper limit. Even if we see that there is an upper limit today, it might be the case that we are able to innovate in terms of storage provision, in terms of the different solutions and products that we have available to be able to address that. I do not see it as an issue. I think going forward we will have more solutions on the table as we continue through this transition to enable us to better manage that, too.

Q50 **Mr Robert Goodwill:** I think it is generally accepted—this is again to Rebecca—that the offshore wind sector deal has been successful. Do you think this sort of model could be applicable to other areas and other technologies, or is that not on your personal agenda?

Rebecca Williams: It is good to hear that the Committee recognises the offshore wind sector deal has been successful and we think it has too. It has created that forum and shared understanding between Government and industry.

For other sectors—if we look at other renewables, like onshore wind—I think the key there is that we have had an investment hiatus and we now need to get on and deploy onshore wind for it to be able to meet net-zero targets and play its role in doing that. I think what the sector deal has done really successfully, as I say, is bring together the Government and the industry to address some of these issues. That is a model that could be replicated in other areas. We would certainly like to see the Government lend that same kind of support to other renewables.

Benj Sykes: I had a bit of a role in the sector deal during its creation. I think it is fair to say that as a new industry—we have only been around in any sense of scale for about a decade—it has been really helpful to build our relationships, and our strategic impact and ability to operate strategically in the UK, so I think it is vital.

If I was going to say what other sectors should have a sector deal, it would be hydrogen. It simply does not exist yet as a sector.

Rebecca Williams: Yes.

Benj Sykes: They need to come together, be a sector and partner with Government because that is the way things happen quickly. We have seen that from all the things we have talked about: aviation, barriers to growth environmentally, the grid work and all the growth partnership work. The list is long. That has all come out of the sector deal and that strategic partnership. If we are going to get our skates on with hydrogen, the sector deal model is the way to go because we know it works.

Q51 **Mr Robert Goodwill:** Finally, in terms of lessons learned, if we rewound to the start to do it all again, what should the sector have done differently, what were the mistakes made and what could Government have done better? Or do you think the path was a smooth one?

Benj Sykes: That is a really difficult question because so much of it has gone well in terms of policy and in terms of partnering with Government. If I could wind the clock back massively, with the benefit of hindsight, it would be the spatial planning point and the grid thing, getting moving on a new solution beyond OFTO. If we had started this work, with the benefit of hindsight, five years ago we would now be in a very different place and particularly those in East Anglia would be happy for that.

We are probably running into the difficulties we are running into because this industry has scaled up so fast because it has been so successful in getting its costs down. I would not say the learning is not to do cost reduction so quickly; it would be to try not to be limited by the pace at which you think the industry can go. I suspect, as Rebecca says, hydrogen will move at an extraordinary pace once it gets momentum. Therefore, we need to be thinking where could hydrogen go, making sure that we do not go down routes in the short term to solve problems that then give us problems in the longer term, given where that sector could go.

Q52 **Mr Robert Goodwill:** Do you feel the planning process has held you back unnecessarily? Do you feel it is a thorough, detailed process that needs to be done or could it be streamlined?

Benj Sykes: I think the planning process is better than we see in a number of other markets, but it is still very challenging. We are particularly in a challenging time at the moment because of those points I just made around spatial planning and the difficulties and environmental interactions that brings, which we need to solve. There are definitely things we could improve in the planning process, particularly in the world we are now in. However, it is by no means something we should scrap and start again.

Mr Robert Goodwill: Does Rebecca want to come in on that? I guess it is better than building airport runways or nuclear power stations anyway.

Benj Sykes: I absolutely agree with that.

Rebecca Williams: What I would like to say is that it comes back to this point around being overly critical of ourselves or perhaps not being as bullish as we could have been around the impact that we would have. There are a lot of people and a lot of organisations that have completely underestimated where we have reached with offshore wind, the International Energy Agency being one. People did not back us to get to the place that we have done. Probably we could have been stronger in the first instance; being more ambitious, setting out our stall earlier on, on what we could do. However, that is the benefit of hindsight, and it is a nice problem to have.

Andrew Jamieson: Hindsight is a wonderful thing, but I recall the earliest days of offshore wind when very few people believed in it, very few people believed both in the technology and also whether the cost could ever be competitive with anything else. We have been a disruptive force for good in offshore wind, showing how we can get our act together and pull the industry together, start to grow the supply chain aggressively and so on. It has been a tremendous success. I cannot think of anyone who fully predicted the scale of success we would have with this thing. There are a lot of lessons out of that and there are a few that—yes, we could have been changing the regulatory world—but I think we need to do more to give confidence to the supply chain because we are growing so quickly and so competitively. I think it takes a while for a supply chain to make very big investment decisions, especially if you are moving from one sector to another. For me the hindsight is we could probably have evaluated that a bit more deeply.

As we look towards our net-zero target, there are three big buckets of things I think we need to continue thinking about collectively, and we have touched on them today. As I said, we have been very successful in growing the industry, but we have to look at what the consenting process is because we cannot allow it to be terribly slow. There is a duty on the industry to work with the consenting authorities to allow these people to have more confidence in their decision making. We ought to be able to help them with data, information and technology solutions towards all of that. That to me is also an area of economic growth, not simply information for decision making. We have to review the grid. The point-to-point methodology will not work for 75 gigawatts—we all know that. We have to think about how to give investor confidence to those who stand by the supply chain. An awful lot of the focus has rightly been on asking the developers to compete, which is why we have been so successful in getting to £40 per megawatt hour today. However, the future needs a good look at, if not reform, in all those of three things: consenting, grid and supply chain. To me that is all innovation, and that is why this Catapult, and my colleagues elsewhere in the Catapult network, working with our colleagues in the research world can make a solid difference to the way we go forward for economic growth in the UK in this energy sphere.

Chair: I would like to conclude the session by thanking all of our witnesses—Andrew Jamieson, Rebecca Williams and Benj Sykes—for a really fascinating discussion. You have given us lots of things to think about and to recommend to the Government to support your endeavour and also a lot of insights into our next inquiry under this framework on hydrogen, which has come up a number of times. Thank you all for your participation, it has been really interesting and I hope you find the report we come up with of benefit in future.

I would like to thank Laura Grant, the Clerk who has organised this session, and say thank you and goodbye to Lydia Franklinos who has finished her fellowship with the Committee. Unfortunately, I do not think she is on the call but I am sure someone will pass on our thanks to her. Thank you to members of the Committee and the parliamentary staff for organising this, subject to the technical hiccup that delayed our start and that hopefully we will not have to endure again. Thank you all very much indeed.