

Environmental Audit Committee

Oral evidence: Enabling sustainable electrification of the UK economy, HC 278

Wednesday 7 February 2024

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Members present: Philip Dunne (Chair); Barry Gardiner; Clive Lewis; Caroline Lucas; Dr Matthew Offord; Cat Smith; Claudia Webbe.

Questions 206 - 266

Witnesses

I: Chris Hewett, Chief Executive, Solar Energy UK; Peter McCrory, Policy Manager, Networks and Charging, RenewableUK; Susie Elks, Senior Policy Advisor, E3G; Olivia Powis, UK Director, Carbon Capture and Storage Association.

II: Ed Porter, Director of Revenue, Modo Energy; Kate Gilmartin, Chief Executive, British Hydropower Association; Professor Sir Chris Llewellyn Smith, Emeritus Professor of Physics, University of Oxford.

Written evidence from witnesses:

[British Hydropower Association](#)



Examination of witnesses

Witnesses: Chris Hewett, Peter McCrory, Susie Elks and Olivia Powis.

Q206 **Chair:** Good afternoon. Welcome to this Environmental Audit Committee oral evidence session with two panels, in our inquiry into grid capacity and the sustainable electrification of the UK economy. I will start by welcoming our first panellists and asking you to introduce yourselves to the Committee and explain your role, starting with Peter McCrory from RenewableUK.

Peter McCrory: Thank you, Chair, and thanks to the Committee. My name is Pete McCrory. I am a policy manager for networks and charging at RenewableUK.

Susie Elks: Hi. I am Susie Elks. I lead E3G's work on UK electricity decarbonisation.

Chris Hewett: I am chief executive of Solar Energy UK.

Olivia Powis: I am Olivia Powis, UK director at the CCSA.

Q207 **Chair:** Thank you. The UK is engaged in what I refer to as the largest economic transformation since the industrial revolution as we try to decarbonise the economy. It seems as though the Government agree that the capacity for the grid to enable us to create a very different kind of energy generation—different in scale and nature—is a key enabler/barrier to achieving that, because they published their report seeking to accelerate the capacity of the grid shortly after we launched this inquiry. Is that an appropriate characterisation? What are the main challenges in achieving this?

Peter McCrory: Absolutely, it is a good characterisation. We are currently going through a once-in-a-generation transformation of the grid networks. You will not be surprised to hear that one of the biggest challenges that members of RenewableUK are currently facing is connecting to the grid. There are huge challenges in getting a good connection. The transmission connection queue is approaching 500 GW, despite the fact that the most ambitious scenario from the National Grid ESO only requires 378, so that is considerably more. Our UK members are receiving connection offers well into the 2030s at this point, which as you can imagine is not particularly conducive to making an investment decision.

The Government, Ofgem and National Grid have been conducting a series of reforms, and a lot of those reforms are very welcome. The Government and Ofgem have produced the connections action plan, which sets out a number of actions and deliverables that will offer all projects a connection within six months of the date on which they request it. National Grid has introduced a queue management system whereby projects that do not meet specific milestones can be moved to the back of the queue or can exit the queue entirely. National Grid is also undergoing



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a long-term reform process to ensure that there is a fit-for-purpose regime in the long term.

All of those are welcome. As we go on, we can discuss how well those are going on track, but ultimately I think we need to realise that policy and regulatory reforms are all well and good, but at its crux this is a physical infrastructure problem. Without rapidly building transmission infrastructure, we are not going to solve that problem because, ultimately, you can reform as much as you want, but if there is no infrastructure to connect to, you are not going to connect. That is my final point before handing on to my colleagues here: that we need to focus on getting that grid built as quickly as possible.

Q208 **Chair:** Susie, can you give us the scale of the challenge?

Susie Elks: Yes. As Peter said, the scale of the challenge is huge. We are talking about trying to entirely change our electricity system. We want to massively accelerate the roll-out of renewables and lots of different technologies while also building low-carbon flexibility so that we can transition away from using expensive gas plant.

As we all know, to do that we need the network to actually connect them to. We have talked about the issues with network connections; there are also problems with constraining renewable generators. At the moment, National Grid routinely turns off renewable generators, particularly in Scotland, and then turns on gas plants in England because it does not have the network to flow that electricity across. It is incredibly expensive and it is adding carbon emissions to the UK economy as well.

The scale of what we need to do is huge. Then we go round to the network itself. There will be a lot of network that needs to be built. We need to make sure that we are building it in the right places and that we are getting community engagement and environmental engagement early on in the process. There is no point in us creating a plan for transmission networks that we take three years or four years over if, when it comes to it being released, we have massive push-back across the economy. We need to make sure that we get that plan right throughout the process.

Also, before we have that plan and can build the networks, we need to make the most of the networks we have today. We can do that through flexible solutions. These are more technical questions, but we have a capacity that we keep in reserve in the networks, which we do not access for various reasons. We can increase the amount that we use that through new modern techniques.

Yes, the scale of the challenge is huge. There are solutions, but they will require long-term focus and attention at the highest levels.

Q209 **Chair:** Are you suggesting that there isn't an overarching plan at this point?



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Susie Elks: There is a good plan at this point, yes. Like we said, the connections agreement document and the transmission acceleration document—the two that came out in November—are really good plans. But there is so much stuff in them that is still at quite a high level, and the question is: is it being delivered well and quickly?

Q210 **Chair:** Chris, connecting renewables is what you are all about. What are the big barriers for your members?

Chris Hewett: I agree with what Peter and Susie said. I can add a bit of colour about what is happening on the ground. I totally agree that the connections, reform plans and the new political impetus behind grid acceleration over the last year has been really welcome and we are starting to get the right rules written.

What is happening on the ground, though, is somewhat different. Last year most of our members who are building solar farms were getting letters saying, “That connection that we thought was going to be 2026 is now 2035”—or pick any number between 2030 and 2040. They are now getting letters back from the DNO saying, “We can bring that forward again now to, say, 2028.”

Alongside that offer, there is a curtailment report, which is around the constraints issue that Susie was talking about. They are effectively saying for most of these projects—I have heard of at least 50 and there are probably more since the beginning of 2024—“Yes, we will connect you, but we will give you a 100% curtailment risk”. It is effectively, “You can build it, you can connect it, but you can’t export to the grid,” which is just a bizarre thing to be putting in writing, to be quite honest. It is equivalent to saying, “You can open the shop, but you have to keep the door shut and no customers can come in.” That is what is happening on the ground, which we are a little bit bemused by.

Q211 **Chair:** Curtailment risk means you cannot export to the grid?

Chris Hewett: Yes. They are saying the DNO’s assessment is that they believe there will not be capacity to export from that solar farm that you have built.

What I think is underlying this—and I think this is certainly where the heart of the problem lies for our industry—is that the assumptions that are being used by the DNOs in those risk reports are flawed. We know that there are some models among the DNOs that will assume a solar farm is exporting power at 9 o’clock at night in January. If that is repeated across the network, of course there is not going to be any capacity on the grid, but it is not respecting the physics of the technology.

The same goes for batteries. Quite often you will see a connection agreement that says, “We will give you connections for 50 MW of solar and if you get a battery next, a 50 MW battery as well, you will need 100 MW”. They are assuming that the maximum capacity from both the



battery and the solar will always be exported at the same time. That is never, ever going to happen in the real world.

Those little bits of detail are starting to clog up the system. There are two things that can be done. One is that Ofgem can require the DNOs to release much more of the data because then the developers themselves will be able to make those curtailment risks, and we believe that they are much, much lower than the DNOs are saying. The other is to change incentives so that the DNOs change their model and start to invest in the capacity of their staff to model the standard technologies that then heighten the model, which is wind and solar. There is not going to be very much fossil fuel or thermal power generation built in the future, and at the moment their models simply cannot cope with that.

Q212 **Chair:** Is it your assessment that it is the lack of distribution capacity rather than the lack of demand that is preventing them from accessing the grid?

Chris Hewett: It is the perceived impact of a lot of solar or a lot of batteries on the system en masse.

Q213 **Chair:** In a particular location?

Chris Hewett: In a particular area. They are then saying that their modelling will say there is no capacity on the grid, whereas in real life we suspect that there will be quite a lot of capacity and we will be able to export quite a lot of the time. We need to model those technologies in an accurate way according to the real world, as opposed to what is on spreadsheets.

Q214 **Chair:** Does this require an understanding of the ability of the grid to cope with increased volumes of electricity being transmitted? Is it that they are basing their models on old transmission capacity that they will have to replace, but until they do so they cannot accept more load?

Chris Hewett: A lot of this is not transparent. It is a bit hard to tell how those calculations are made. With the ones we have seen, it feels like the calculation is being made as if this were a power station in the traditional way: you turn the gas up and down and it could export at its maximum capacity at any point during the day in 24 hours. Solar is very predictable. We know when the sun is coming up and going down. We know that through the months it varies. That variation does not seem to be being factored into some of the decisions around capacity. There is more room on the grid than they are saying. That seems to be what is happening.

Q215 **Chair:** Who are the parties who can break that misunderstanding?

Chris Hewett: The DNOs themselves can certainly take action and change the way they are modelling their assumptions. They can also release a lot more of the data so that the developers and other consultants can start to do some of the calculations themselves. I think a



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bit more transparency is required from the DNOs. It is certainly an action that they can take, and Ofgem could take action to force the DNOs to do that.

Q216 Chair: Olivia, your projects are further down the track. Could you just illustrate for us the kinds of timescale in which your members need capacity in the right place for the different clusters that are being considered?

Olivia Powis: Yes. To start with, it is important to set out the role of CCUS and low-carbon hydrogen. They will play a key role in delivering energy security by providing flexible low-carbon power that will enable more renewables on to the system and provide a more resilient electricity mix and will also reduce reliance on imported fossil fuels. The context of CCUS in being able to balance the grid and decarbonise the grid is absolutely critical. Having timely connection is, of course, important. I think, for first-of-a-kind projects such as CCUS, it is being able to get through, having that connection and also planning and consenting in time.

On timescales, the Government's commitment is that we have two CCUS clusters operational by the mid-2020s and a further two by 2030. These are the timescales that we are talking about, and then being able to capture and store 50 million tonnes by 2035. There is a huge trajectory, and we have a long way to go in the next six years to 2030 and then by 2035. We absolutely need to be planning and preparing for that.

There are already some delays in reaching the final investment decisions for track 1, which we are hoping to reach by this summer, with everything to be in place by then and two more by 2030. Any further delays for connection to the grid, on power CCUS, would impact the whole of those clusters and the whole of the networks moving forward.

We really have to have long lead-in times. It is also worth noting that Ofgem will be regulating the CO₂ networks, so it is important to learn all the lessons that we are talking about now for the electricity grid and the CO₂ networks. It is making sure that we are building in strategic investment ahead of need, so that when we have the industrial projects that will be connecting to the networks in the late 2020s or early 2030s, there is capacity on those networks and they are able to do so. We do not want to be in a position where they are ready and have fitted the carbon capture technology, but are not able to connect to the networks and have capacity there.

Q217 Chair: The location of all of the clusters is already known and the investment leads are identified. Are discussions under way with DNOs in those locations? Is there any sense that there might be jeopardy to the timetable from a lack of engagement by the DNOs?

Olivia Powis: They are in discussions, particularly those that are further ahead in the process, the two that are selected for track 1 and then track



2. They are engaging; there is regular engagement with Ofgem and DNOs at the moment. I think everything is in plan and we have not heard of major issues with the electricity network, but obviously things change on the network rapidly. Between now and the point of connection, things can change but some of these are also existing power stations, so some of it is new capacity but not all of it is.

Q218 **Chair:** We touched on some other principal barriers, and planning is often cited as a major challenge. Chris, you are leaning forward. Do you want to pick up the planning issue?

Chris Hewett: Yes, absolutely. Quite a lot of solar has already received planning permission—16 GW of solar farm proposals have planning permission already. Another nine are currently going through the system. We know that there is a lot more to come; some of that will be going through local planning and some through the national infrastructure planning system.

It is not all bad, but there is a “but”. We absolutely have a capacity constraint in the planning system. It is a twofold thing: first, there are not enough planners and, secondly, the planners who are there do not necessarily understand the technologies that they have to look at. They are sometimes starting from scratch and having to learn these things, and so it is a case of reinventing the wheel in lots of parts of the country, which does not need doing.

There is a kind of twin capacity constraint. Release needs to happen in the planning system, and we are working with the Government to talk that through. I am sure that RenewableUK and others are doing the same. Yes, there is—that is the short answer.

Q219 **Chair:** The Government’s ambition is to cut in half the time it takes to achieve planning for major energy infrastructure projects. Is there any evidence yet that the ways they intend to do that, using a national override, are working? Or is it too early to tell?

Peter McCrory: To be honest, it is probably too early to tell at this point. We got the report from the electricity networks commissioner, Nick Winser, last year, and the Government have now produced the transmission acceleration action plan. The aim of that is to reduce by half the time it takes to build the national transmission infrastructure projects: from 14 years to seven years. I think that the recommendations are good and, if they are brought forward in full, will lead to a reduction in that time.

It is probably too early at this point. We have seen an updating of the national policy statements recently. Again, I think what we see in the national policy statements is good, but it has come ahead of some of the grid planning documents that we are expecting to see. We are expecting to see a new form of National Grid plan called the centralised strategic network plan, and a document about how we choose what type of grid



infrastructure to build called the electricity transmission design principles. For those documents to have the correct weight and to achieve their aims of reducing the time, they need to have full endorsement in the planning documents.

I think that there will probably be a need to go back into the national policy statements. They currently reference them as they are coming along, but obviously you cannot endorse a document that does not exist yet. My hope is that once these documents are finalised—and as long as they are achieving the aims that they are supposed to do in giving clarity about planning decisions—the national policy statements will then be updated to endorse them fully so that we lose a step that grid projects have to go through at the minute.

Q220 Chair: Does this apply equally to transmission? Securing planning consents across constituencies like mine has been very controversial in the past where there has been an upgrade required to a whole line or a new line being put in. Do you think that there are measures in place to make that more achievable at local authority level?

Peter McCrory: I hope the plans that we are seeing will improve engagement with local areas and local constituencies and provide more information at an earlier date about what infrastructure is needed, why it is needed and where it is going to be. Any national plan and national context will need to then be partnered with local engagement. That will need to be the project builders, National Grid and local planners engaging with communities, understanding their views and taking them on as well.

Q221 Chair: The last question from me is whether we are currently on track. Chris, you touched on the amount of solar that is currently in progress. Do you think that there are enough projects going forward to meet the Government's ambitious targets on both wind and solar? Susie, are you able to talk about the overall picture?

Susie Elks: I am happy to. Yes, I think the industry is there, the pipeline is there to deliver these targets, and from what we hear it is raring to go. We need the network there so that they can connect. We need to continue to fund these technologies and de-risk them. It is currently through the contracts for difference scheme, which the Government are looking at reforming. These are low-carbon technologies that need some reductions in risk from the Government so that they can be built and reduce bills for consumers. Yes, they are ready to go.

I will also point to low-carbon flexibility technologies. As well as the renewable technologies, for us to meet our decarbonisation targets we also need to be building the type of low-carbon flexibility that Olivia is talking about, and those industries are in quite a different situation. They have not had funding for the last 20 years like renewables have, so we have not seen costs fall dramatically like we have in that space. With a lot of these technologies, we could see really positive stories where costs



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fall and they can bring down bills for consumers, but we need to start making the moves now to support those technologies.

Chair: Thank you. Chris, do you want to add anything?

Chris Hewett: Yes, we definitely are raring to go. The investment is certainly there for solar to deliver 70 GW, with the definite caveat that the grid needs to be there as well.

On the grid planning thing, there are some other things in the process that are quite important. Some of the planning process is a little bit too onerous. Even some lower voltage networks that just require a wooden pole require a national infrastructure project planning system. It takes an awfully long time to get a fairly straightforward wooden pole line agreed in parts of the country. Things like that could be removed.

On the national infrastructure side, for solar, it could also be centralised and streamlined. The NSIP process is designed for nuclear power stations or for offshore wind, which are very large engineering projects. Even the largest solar farm is still quite a simple piece of technology compared to some of those. You could streamline that. It is worth saying that the Secretary of State has one major solar project ready for decision and it has sat there for the last six months.

Chair: Decision not made for six months?

Chris Hewett: Yes.

Q222 **Barry Gardiner:** I want to switch attention from the big behemoth of the national grid and look more at mini-grids and community energy generation schemes. Ms Elks, will reform of the grid rules and procedures be important in facilitating more distributed energy technologies?

Susie Elks: At the moment there are quite a lot of barriers to these technologies creating local systems. We have talked about distribution network reform a little bit and there is a lot going on in that space. It is enabling low-carbon technologies to connect and enabling consumers to install electric vehicle charge points, solar panels and heat pumps and let all of those operate in an intelligent, flexible way.

There is a lot of work going on in that space, but I think that there is a need for it to be better co-ordinated. It sits across a lot of different processes at the moment, so you have distribution networks and the price control process called RII0. That decides how much they are allowed to invest in their networks. We have things going on there; we have the wider reforms that we have talked about today; and there is also market reform going on. A lot of the funding mechanisms for technologies fund large-scale national projects. They do not fund smaller-scale local projects.



All of these things need to be brought together collectively to look at how energy policy is working on a distribution network level and for local energy systems.

Q223 Barry Gardiner: This Committee is all about making recommendations to the Government. Can you be more specific about the sort of recommendations that you would like to see for those reforms to facilitate mini-grids and local energy systems more fully?

Susie Elks: Yes. I would like to see further innovation funding for local energy systems. I would like the REMA—review of electricity market arrangements—consultation to be released. I would like to see the next wave of it actively look at small-scale renewables, as to date it has only looked at large-scale projects.

A lot of the stuff is going on, but it is so spread out that it is hard to see the gap, so I think a local energy strategy of some kind that pulls these things together would help everyone in the industry.

Q224 Barry Gardiner: Thank you; that is a helpful suggestion. I am sure the Clerks have taken it down.

If we are looking at low-carbon generation, how well does it lend itself to more localised grids and community energy settings? I put that one to the panel as a whole.

Chris Hewett: Very well, yes. Probably the majority of solar is connected to the distribution network, whether it is ground-mounted solar farms or rooftop projects on a school or a factory or the residential side, so most of solar is enabled through that route. Susie is right: there are a whole load of entangled rules and regulations that can be removed to accelerate some of that, because the demand is huge in that sector.

To give you an example, I know of a company that has an agreement and has the investment there to do a 2 MW solar roof on a factory or a warehouse, which is entirely for its own self-consumption. It is only designed to be used on that site. They are refused connection to the grid because the grid is saying that there is no capacity to take that 2 MW. It is not going to be exported to the grid. There will obviously be times when there will be a little bit of spill on to the grid.

Barry Gardiner: I think you have used this example to us before.

Chris Hewett: There are many of them. That is one specific thing: that if you are doing on-site generation the grid capacity constraints should not really be an issue.

Peter McCrory: It is something that our members have seen as well. They are looking to build renewable electricity generation on sites and then struggling to get a grid connection because the DNOs are saying that there is no capacity on the grid, despite the fact that it is being used on sites. There is the same thing with co-located assets.



You could have a wind farm that has been there for a reasonable amount of time and is looking to diversify and add battery storage or potentially hydrogen production to the site and have a shared connection. The DNOs are modelling that as if it is going to be additional capacity, when it should be seen as shared capacity and could be regulating the grid rather than adding stress to the grid. They are being pushed right to the back of the queue, when in many ways it makes sense to accelerate.

Q225 Barry Gardiner: What you are saying is that mini-grids can be a positive to the grid by making sure that the capacity there is being utilised and not having to go back in, so the connectivity that the grid fears is not going to be—

Chris Hewett: Effectively it is a demand reduction for the transmission network.

Peter McCrory: With the correct management, absolutely, it can be an asset.

Q226 Barry Gardiner: How much could we be doing in this area if the regulatory regime and the incentives were got right? You cannot do away with the national grid—you want the national grid; it has to be there—but just what capacity is out there to be using mini-grids and community energy schemes, if the framework was the right framework?

Susie Elks: I am happy to come in on this one. Unfortunately I cannot give you a number, but it is worth discussing for a second what you can mean by a mini-grid, because there are a few different permutations that would probably have different answers to your question.

In one view of the world, each local area has its own electricity network that can operate independently of all the others; if another goes down, it is happy to continue by itself. We think that would be incredibly expensive. You would have to be gold-plating every village in the country to be able to do it. That is one extreme end, which we would probably say to avoid. At the other end, you might have distribution networks incentivised to pay local people and local industries to flex their demand to help manage the network, lower the cost to consumers and reduce the amount of network that needs to be built.

Barry Gardiner: By constraint.

Susie Elks: Exactly, but on a more distribution network level. Distribution network operators have been looking at doing this for quite a few years as part of the Energy Networks Association through the open networks project. I think that is the space where you have a lot of potential. They are already procuring whole gigawatts to help them manage their distribution networks. We need to see that expanded and turned into a much more open-looking project. These are very techy things at the moment. As a normal household, you do not have a nice PR campaign in your area saying, “You can flex your electric vehicle and save yourself money.” We need to start talking to people about this in



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real words that they understand. We need to join them up with the transmission problems that we are having so that all of the distribution network flexibility can help us to manage transmission network constraints.

Barry Gardiner: That is very helpful.

Susie Elks: Unfortunately I cannot give you a number for how good that would be. I would say that if we get that wrong, we will be in a lot of trouble.

Chris Hewett: Do you want a number? I can give you a number. It is not a comprehensive answer, it is not our number, but it is the UK Warehousing Association's number. It has calculated that with fairly conservative assumptions about how much roof space you could use for solar, its members alone could deliver 15 GW of electricity and most of that would be, if not on site, near site. It is very interested in talking to the neighbours of its sites—they are often in industrial estates where there are lots of different electricity demands—about whether you can find a way of effectively peer-to-peer trading, so that if you do not use all the solar from off your roof, you can sell it to your neighbour. At the moment, the rules for doing that are very complicated. There is a lot of potential there and a lot of interest from those players.

Q227 **Barry Gardiner:** We want to achieve a net-zero power system by 2035. Do you think that the five-year business plan cycle for network regulation is adequate to get us there?

Susie Elks: I am happy to take a punt on that.

Barry Gardiner: Put your head on the chopping block.

Susie Elks: I think it is not ideal. I think that there are things that you can do, though. Ofgem does a five-year review process but has flexibility within that. A reopener has been done within the current price controls that allows Ofgem to say that if things have materially changed from when they made the original plans, we can reopen them and look at new infrastructure. You can look at whether it is five years or three years. I think what really matters is the flexibility, how accessible it is and how easily it works.

Barry Gardiner: That is another one of the key recommendations that you would like us to make in our report.

Susie Elks: The reopener is already there. I am not aware of how easy it has been to access. Other people on the panel may know more.

Barry Gardiner: You want greater flexibility.

Chris Hewett: I think it is absolutely true to say that the generation technologies are moving at a faster pace than Ofgem's five-year cycle. The amount that wind and solar can invest now is hugely different from



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what it was five years ago and will be again in five years' time, so there have to be ways of making it more flexible.

We could add in batteries as well: both behind-the-meter batteries and utility-scale batteries are growing at pace. That needs to be factored into the equation.

Barry Gardiner: I am not going to cut you off but, Olivia, the Chair as alerted you to the fact that I have to be down in the ESNZ Committee in seven minutes, so please—

Olivia Powis: Be brief?

Barry Gardiner: Yes; please do let the Committee hear what you have to say.

Olivia Powis: It is important that within the five-year cycle, there is some ability to look at how new technologies—gas, CCS and blue hydrogen—are evolving and they are assessed. I also note that RIIO-ED2, ends in 2028 so there needs to be engagement during this price control period for the next one because that is when we will have power CCS and projects related to that, which will need grid connections post-2028. That has to be done now; we cannot wait until 2028.

Q228 **Dr Offord:** I particularly want to ask Olivia about carbon capture and storage and the viability of its ability to play a key role in the grid. Is it sufficiently developed?

Olivia Powis: Yes, it is sufficiently developed. We are not talking about a new technology; it is a technology that has been in operation for over 25 years in Norway, and globally many projects are operating or in development. The technology is proven and is there. We have a huge pipeline of projects in the UK. We did a delivery plan in 2022 and we found projects that wanted to capture and store 70 million tonnes of CO₂ per year. We redid it a year later and the amount had gone up by 29%, with projects in the UK that wanted to capture and store 94 million tonnes of CCUS.

There are 12 clusters across the UK looking to deploy CCUS. Four of them are in discussion with the Government about their cluster sequencing process. There is huge potential there to move forward. The private sector is ready to invest. We estimate that there is up to £40 billion to invest in projects up front between now and 2030 and up to 2035. Operational funding will only be called upon once those projects are operating.

However, we need to move forward. There is only one power CCUS project in negotiation with the Government at the moment. Of all the projects that we know about—about 90 projects in the UK—eight are currently in negotiation with the Government and one is power CCUS. The goal of having one power project by 2030 will be met but we need to move forward more quickly. Those clusters need to reach their final



investment decisions. This summer, we need to move forward with the track 2 projects and then have all the other clusters good to move forward so we can have a decarbonised grid by 2035.

Q229 Dr Offord: You said quite a lot there. I will try to catch up. First, you said that several projects were still in the pipeline. If you could put a figure—I do not mean a number—on the size of the current market, how much more capacity is there to achieve?

Olivia Powis: For CCUS?

Dr Offord: Yes.

Olivia Powis: Huge capacity. We need to get to capturing 20 million to 30 million tonnes by 2030. We know that there are up to 90 million tonnes in the pipeline, so there is a huge pipeline of potential projects that could deploy CCUS, but of course they will not all go that way and some of them will decarbonise in other ways. There is huge potential there, but for meeting the Government's targets of 20 million to 30 million tonnes by 2030 and up to 50 million tonnes by 2035, it is all there, and much more.

The CCUS industry is not only pivotable for achieving a decarbonised power grid, but essential for providing flexible low-carbon power to allow more intermittence on to the grid, which lowers the cost for consumers. We estimate it can provide a cost saving of £280 per household as a system-wide benefit. It will also create 70,000 jobs. We estimate that it will protect up to 77,000 jobs in industries in key areas earmarked for levelling up in industrial areas around the UK. These are all industries that have to decarbonise and for some of them, CCUS is the only option. If we do not move forward and deploy at scale, we will lose a lot of these benefits and a lot of the inward investment that could come to the UK.

Q230 Dr Offord: In your previous answer you mentioned that there is one project still continuing with the Government. What could the Government do to increase production and the roll-out of CCS?

Olivia Powis: There are a few key things. The first is signing the final investment decisions this summer for the track 1 clusters and then the first CCUS power project would move ahead. The second is moving forward with track 2 clusters and then providing a longer-term allocation framework, very similar to what happened for offshore wind, so that investors can have certainty, can look forward and know that there will be future opportunities to bid into the system. That will provide the right signals to investors to continue to invest in developing the stores, transport and storage required. Having that forward investment plan and the Government committing to it for money that will only be drawn down from 2028-29 onwards will provide the right signal and a functioning ETS market.

Q231 Dr Offord: I will give an opportunity to the rest of the panel after that comprehensive response. To the whole of the panel: are there any



blockages in the current system, particularly in the region of skills, preventing the roll-out that Olivia has highlighted?

Peter McCrory: Yes, there is great demand for skills in the renewables and low-carbon energy sectors. RenewableUK has forecast that we will need to employ an additional 70,000 people by 2030 to meet the requirements. The Green Jobs Delivery Group's network and power labour intelligence report identifies a number of high-priority roles across the power networks sector based on the perceived difficulty of acquiring skills—engineers, network engineers, developers and planners. It has been a challenge. We are expecting the Government to come up with their green skills action plan in March. We—not I, but some of my colleagues—have been involved in that and we should take forward as priorities the actions that come out of that plan.

A lot of the focus on skills so far has been looking at secondary and tertiary education. We are starting to understand how we can encourage young people to move into the renewables sector and give them opportunities, and that is hugely important, but we have estimated that 80% of the people who will be needed for 2030 are currently already in the workforce. We also need to focus on upskilling and reskilling, giving people opportunities to move into the sector from areas such as the oil and gas industry, the armed forces or construction industries. There are opportunities for those people to move into good, long-term, secure careers in the renewables and the power network sectors.

Q232 **Dr Offord:** You mentioned a few sectors there. Would people in those sectors have transferable skills or would they need to be retrained?

Peter McCrory: A lot of skills from the oil and gas sector are transferable to offshore wind. There will be some differences but many of the skills used in oil and gas work will be highly transferable to offshore wind.

Q233 **Dr Offord:** That is useful to hear. Putting the skills issue to one side, are there any specific supply chain issues?

Peter McCrory: Procurement is an issue within UK networks as a whole. We have three transmission operators building and procuring for network transmission infrastructure. On the offshore side, we have developers procuring for their high-voltage offshore infrastructure. This leads to less capacity for block booking and procuring as a UK plc approach.

Looking to Europe, the Dutch-German transmission system operator TenneT was able to put in an order with four equipment manufacturers for €30 billion. It has basically secured its offshore network infrastructure needs for the next 10 years, and I think it has made a good-value decision. A good opportunity for the UK would be to look at how we can start to aggregate procurement with different parties trying to procure highly sought-after network infrastructure equipment in the next 10 years.



Chris Hewett: I can tell you a similar story on skills and the supply chain for solar. You are probably aware that we are running a taskforce jointly with the Government at the moment; I am jointly chairing it with Andrew Bowie, the Minister for Nuclear and Renewables. There are working groups on grid, on skills and on the supply chain.

On the skills side, there is a story similar to RenewableUK's in the wind industry. There is an opportunity to transfer skills from the mainstream power sector. If you have worked in a gas-fired power station, there is no reason why you should not be able to use some of your skills in solar or batteries. There is certainly a lot of demand for working with FE colleges trying to get more people. There is a massive demand for electricians across the sector at the moment. There are lots of different things we can do there. As well as all the other work we do as an industry, we need some Government support and investment into making sure those skills gaps are filled, that the training courses are there and that there is a pool.

On supply chain, there is a regional element. In some areas such as Nottinghamshire and Lincolnshire, we are shutting down some coal-fired power stations and we are about to build quite a significant amount of solar and batteries. Look around that region: the ex-coal-fired power station is there because it is an ex-mining area. There will be a significant number of construction jobs in building the new clean power system in the regions' towns and cities that need economic regeneration for historic reasons. There are real opportunities there.

As for the supply chain, people will always think about solar panels that in a sense China has cornered the market. We will not be able to compete with the far east market and start building solar modules in the UK, but we can build batteries and we can and do build the mounting equipment using UK steel. A lot of the balance of systems—the switch gear, the cabling, all that sort of stuff—can definitely be made in the UK. We are about to open a factory for residential batteries in Stoke.

On recommendations to the Government, my perspective is that we hear a lot about EV batteries and clearly they are a massive part of the motor industry's supply chain, which is very important, but we hear very little about residential batteries, stationary batteries and utility-scale batteries, of which a lot are being constructed in the UK. There is a real manufacturing opportunity there.

Q234 **Caroline Lucas:** Following up on that—forgive me if you have already covered it—I remember putting down amendments to a training Bill around passporting, making it easier for oil and gas workers to retrain to become active in the renewables sector, notwithstanding that many of the skills are already transferable. Has that happened? I know that there are plans for this passporting thing. Have you covered that already, and I have missed it?



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Peter McCrory: We have covered it a little bit. Some of my colleagues who are focused mainly on skills are working very diligently with our colleagues in the oil and gas sector.

Q235 **Caroline Lucas:** Is there something that the Government need to do to speed that up?

Peter McCrory: I will need to come back to you on that, but I am happy to do that.

Q236 **Caroline Lucas:** Sorry, my brain is running behind everybody else's, so I am going back to Barry's question quickly. Susie, you were talking about different kinds of mini-grids and how there are different definitions thereof. Did you also cover the issue of public ownership? I think I remember reading about Hamburg or somewhere else in Germany where some of the grids are in public ownership. Does that ring any bells with you?

Susie Elks: I didn't cover public ownership. Out of interest, were you thinking of grids as in the network infrastructure in public ownership, or maybe the local assets? There is a lot of discussion about community-owned energy projects, say the community owning the solar panels on a school roof or owning local batteries.

Q237 **Caroline Lucas:** I thought I had read something more about the grid. I will go away and look that up again, but I thought there was something about how in some places you could have the grid in something closer to public ownership.

Susie Elks: I am not sure about that.

Chair: It was just your natural enthusiasm carrying you away, Caroline.

Q238 **Caroline Lucas:** I am going to look it up on Google as soon as I finish here.

The questions I am meant to be asking you are about the roll-out of low-carbon energy more widely. As we have been saying in the session so far, the Government have aspirations for the roll-out of wind, solar, CCS and so forth and you have already touched a little on this. Could you say how likely you think it is that the UK will achieve its targets in those different areas—solar, wind and CCS? Also, what further activity could the Government be undertaking to support industry in meeting those aspirations if that is necessary?

Peter McCrory: The action on networks in the past year has been very welcome. As Chris and Susie have said, the investment is there ready to go, to deliver on the Government's net zero aims, and that investment is not going anywhere else. That being said, there are challenges. On connections, as Chris said, there are challenges with the reform, and that network build has yet to take place. If it does not happen at the pace that is being asked for, we will not meet the goals.



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The next big fork in the road will be the next auction round for the CfDs in delivering offshore wind. Very unfortunately, we did not see any offshore wind procured in the last auction round. We have seen a positive administrative strike price come from the Government for the next offshore wind round, but we need to see that being followed up with a strong budget and additional regulatory measures.

Susie Elks: All the pieces are there for us to achieve our 2030 targets. There needs to be a really strong focus now on delivery. We have talked about the very impressive documents on networks that have been released but they do not mean anything unless they are followed up by some high-quality documents that can lead to us seeing the networks being built. That is just one example. I think you also see the same in funding for renewables, for solar and offshore wind. We have some fantastic mechanisms for funding these technologies, but if we don't see the funding pots come through, it doesn't mean anything.

I think we have all the pieces there. We now need to focus, every year, on making sure that we are moving forward with the tools that we have.

Chris Hewett: The investment is absolutely there for solar. Whether it is for behind-the-meter, residential solar, commercial projects or the large solar farms, it is there. The big three issues are the grid issues, which we have already covered; skills and genuine support from the Government to make sure, in a targeted way, that the workforce is there; and streamlining planning. Those are the three things that absolutely must happen.

Olivia Powis: For CCUS, it is about moving forward and getting the first two clusters, those projects, signed and up and running. Private sector investment is there and ready, but we must move forward with them. We need the certainty of the future pipeline, having allocation rounds very similar to what we have for offshore wind and providing certainty for all the other clusters. Then we will achieve economies of scale and see the technologies move forward at pace and accelerate.

We have talked about planning, particularly around permitting and consenting. That is quite key for CCUS, making sure that all the different agencies are talking to each other across government.

Then there is delivering a healthy supply chain of a skilled workforce. For supply chain, it is about having that certainty. For projects and industry to invest in the supply chain here, they have to know that there will be projects moving forward from now until 2035 and beyond. The Government need to provide that certainty for them to transition and invest, to transition the workers and invest in skills and training. Also, the workforce needs to know this is certain and will move forward if they are going to transition.

Then there is building public support, which I think is key. This is an election year, and for CCUS it is a critical year. We must get these



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projects over the line, we must make progress with all the others, and having cross-party and public support is critical.

Q239 **Caroline Lucas:** Do any of you have any reflections on whether there are things that Ofgem should or could be doing? Are there things it is not doing at the moment that could help to accelerate movement in this direction?

Susie Elks: Ofgem now has its specific net zero mandate linked to the carbon budgets. We have seen a shift at the higher levels of Ofgem, but there are still localised areas in Ofgem that are thinking quite naturally in the way that they have been thinking for last 20 to 30 years—well, I don't know if they have been around that long, but as long as they have been around. By that, I mean focusing on saving pennies rather than focusing on saving hundreds of pounds.

We have seen that particularly with networks, where there have been a lot of very long conversations around small details of network reform, like "Do we build the network here?" or "Do we slightly shift it there?". If the original plan had been taken as, "Yes, there is a net benefit in this, let's do it," we would not be in the situation we are in now.

We need that to change. We need to see Ofgem being prepared to make difficult decisions where there is a net benefit to the UK and not being incredibly worried about making mistakes over a few pennies. It is hard to know if that shift has happened yet or if it is happening, but I think we need to pay very close attention to the individual decisions that come out over the next year or so.

Olivia Powis: I also think the strategic investment point about enabling forward investment in the networks is critical. Sensible investment in the networks ahead of need is critical to moving forward, particularly with new technologies. Ofgem will have to be more flexible there and understand how it will put more resource into understanding how they are going to develop and be prepared to invest in those networks in anticipation of future connectees.

Chris Hewett: Ofgem needs an institutional mindset change. I agree with Susie's points. We are now in a situation where the quicker we can get wind and solar on the system, the more likely we are to drive consumer bills down. Saving the pennies on the network is not going to save money for the consumers because it will keep expensive gas on the network for longer, maintaining high bills as opposed to driving lower bills. That may be understood by Ofgem's leadership, but I am not sure that it is understood across the institution.

Peter McCrory: To sound a positive note in Ofgem's favour, in the last price control period Ofgem produced a document on accelerating strategic transmission investment, with 17 projects and £26 million-worth of investment that it was trying to accelerate to help get more offshore wind on the system as quickly as possible. In the most recent price



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control period, Ofgem has committed to rolling that process out to the wider networks and that critical infrastructure. I think that ability to accelerate has come through from Ofgem.

After that positive point, I have to come in with a more negative point on the offshore network. We are seeing some struggles with Ofgem to do with building the offshore co-ordinated network. It is currently being built by offshore wind developers who are being asked to build connectors to connect wind farms not just to the shore but potentially to other wind farms or with transmission assets, maybe those that are coming down from Scotland into the south coast, trying to reinforce the network in that way.

There are challenges with getting developers to deliver that infrastructure. They are being asked to deliver multibillion-pound pieces of transmission infrastructure on behalf of competitors, essentially, and Ofgem, with its cost disallowance process, often disallowing up to 10% of the costs the developers are expecting to make. If Ofgem expects a developer to deliver a piece of infrastructure on behalf of a competitor and lose 10% of their investment, we will not see very much infrastructure being built offshore. There needs to be a lot of thought quite quickly about how the offshore network will be delivered.

Q240 **Caroline Lucas:** Is there anything else that you have not yet said about planning reforms that would be relevant here—particularly for wind, I guess, but you may feel that you have covered that sufficiently?

Peter McCrory: Onshore wind has essentially been banned in England for a number of years now. I know that the Government have offered some reforms to the national planning policy framework, but ultimately we do not see them as being enough. I think you can see that from the number of wind farms that have come forward.

Q241 **Caroline Lucas:** What would it look like if it were enough? What would the Government have to do?

Peter McCrory: Ultimately, we need wind to be treated like any other sort of infrastructure. At the moment, it is not.

Q242 **Caroline Lucas:** Finally, do you get the sense that the Government are working across all Departments in a sufficiently co-ordinated manner to deliver the growth of clean energy in the way that is needed? Is there any problem, as there often is in other areas, with different Departments not necessarily co-ordinating as well as they could?

Peter McCrory: For the networks, we have seen quite good co-ordination between Government Departments since the publication of the transmission acceleration action plan. They have developed the electricity networks delivery board, chaired by Minister Graham Stuart. It has a membership from across the Government and looks at all the different issues. We have been pleased to see that being implemented.



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However, something we talked about before coming to this Committee was that the delivery board was meant to work alongside a change committee. We are doing the delivery quite well but oversight of what change is doing to other parts of the sector is also very important. We have not seen the change committee be established, but think it would be a very useful body.

Caroline Lucas: Does anyone else want to add anything on that?

Chris Hewett: The rhetoric from the top is not helpful. There is clearly a lot of detailed work going on within the Department for Energy Security and Net Zero on delivering the net zero target, but when speeches are made questioning the priority of that target, it is not helpful for that Ministry.

Olivia Powis: I agree with that. From our point of view, DESNZ is co-ordinating across the regulators, although there is still work to be done with arm's length bodies on planning and permitting. We need overall messaging and commitment from Treasury to move forward, especially on a funding envelope.

Caroline Lucas: Thank you. For the record, according to the *Financial Times*, the good people of Hamburg did indeed vote to bring their power grid into public ownership, so I look forward to further investigation on that subject.

Chair: Thank you, Caroline. A quick final question from Claudia Webbe.

Q243 **Claudia Webbe:** In a former life I led on an initiative in London to take waste heat from the London underground to power up homes, schools and local infrastructure. It was called the Bunhill Heat and Power Network and still exists. Having taken the waste heat from the London underground and powered up homes and local facilities, including schools, the surplus heat went back to the grid, either for storage or for sale back to the grid. The idea was that the scheme was to be rolled out across London and, in addition, had the project gone on, waste heat from the canals and waterways could also have been used to create localised sources of energy. Had that sort of development taken off, would the grid have been able to handle the level of surplus from these types of projects?

Susie Elks: Well done on making that project happen. It sounds very impressive.

At E3G, we have done quite a lot of work on heat decarbonisation. They are still trying to get heat networks rolled out across the UK and there is a lot of work in that space. If we look at where heat networks can happen, they are generally a better option than other technologies and it is a priority for the UK to get heat networks in the right places where they can supply low-cost heat to consumers and we do not then need to massively reinforce the distribution network in the same way as we may have done.



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We need a proper process for doing it, and there is policy work going on at the moment on it—I can put you in touch with some of my colleagues who work more closely than I do on that—to ensure that if we are looking at a specific area and a heat network is going to go there, the distribution network operators take that into account and do not look to reinforce their networks in the same way they might otherwise have done. That is happening to some degree, and we can make sure that that is embedded across processes so that we are making space on the electricity network by pursuing these options. Again, I cannot give you a number on how good it would be if we did that, but I think it would be transformational.

There are other technologies, though, that will be coming on to distribution networks. We have talked about embedded generators coming online and also about electric vehicles and charge points. There are other things that the distribution networks will need to deal with and other ways we can manage those technologies to try to limit the impact on distribution networks and the extra money we need to spend on them.

Chair: I think we will leave it there. That concludes our first panel. Thank you all very much indeed.



Examination of witnesses

Witnesses: Ed Porter, Kate Gilmartin and Professor Sir Chris Llewellyn Smith.

Q244 **Chair:** Welcome to our second panel of the day on the subject of the electrification of the economy. In this panel, we are talking in particular about energy storage.

I would like the panellists to introduce themselves and explain what they are doing that is relevant to that. We will start with Professor Sir Chris Llewellyn Smith, a distinguished professor of physics at the University of Oxford who has recently been focusing on this issue.

Sir Chris Llewellyn Smith: I am an emeritus professor of theoretical physics, but I have done some very practical things. In the 1990s I was the director-general of CERN. I put together the proposal to build the large hadron collider and got it funded, so I know about very big projects. For the last 15 years, I have been working on various energy issues; for the last three or four years I have been leading the Royal Society's study of large-scale electricity storage.

Kate Gilmartin: I am chief executive of the British Hydropower Association. Under our banner we also have the Tidal Range Alliance.

Ed Porter: Hi, I am Ed Porter from Modo Energy. I am the director of revenue. We work with people who own and operate battery storage in the UK to work out how it makes money today and how it will make money in the future.

Q245 **Chair:** Thank you all. We will start with a general question and with you, Chris, if I may. Could you give us a sense of the role that energy storage needs to play to decarbonise our energy system?

Sir Chris Llewellyn Smith: Yes. A large part of our electricity is going to be provided by wind and solar, because they are carbon free and cheap. But of course the wind does not always blow and the sun does not always shine, so they have to be complemented by some very flexible supply or by using excess that has been stored when wind and solar supply is greater than demand. However, if you want to use something other than storage, the only large-scale, low-carbon sources are nuclear, gas with CCS or bio with CCS. These are very expensive, especially if operated flexibly. It is therefore attractive to think of storing and using the excess energy, which would also free us from imports and give us energy sovereignty.

In our report, we have focused on large-scale electricity's storage needs in 2050 and how they might be met in Great Britain. The detailed studies of electricity—we have not made a very detailed study but we have looked at a number of options—are heading in the right direction. A lot of the studies you see are full of very complicated details, where you cannot see the wood for the trees and you are not clear if they are going in the right direction.



When you model storage, you have to compare a model of demand with the availability of wind and solar, hour by hour over a very long period. We used a model of 2050 electricity demand lent to us by AFRY and we looked at 37 years of continuous real weather data to model the wind and solar. We found that 37 years is not enough, so we added contingency. The major finding, which has been missed by most studies of storage, is that the wind varies interdecadally by a very large amount. In the period we studied, there was much less wind in the three years of 2009 to 2011 than there was in any other three-year period from 1980 to 2016.

To meet that, you need to store a lot of energy for a very long time. In our modelling we find that there are two unavoidable core needs of storage. You need some storage that can respond extremely rapidly when a system trips, a transformer breaks or the grid goes down—the proverbial half-time cup of tea in the FA cup final and so on. That could probably be provided by batteries. It does not take much energy. We cannot study it, because we do not have the resolution for that, but we costed it. We took a guess and we costed it but we did not study it.

The other thing that is clear is that to meet this problem identified in 2009 to 2011, you have to store some very large amounts of energy for very long periods. I am talking about 20 or 30 years. If you are going to do that, you need to have something that has a very low cost per unit of energy stored. The leading candidate in Great Britain—globally, in fact—is hydrogen. Hydrogen can also provide storage for a couple of hours or a day or a week or a month so you could, in principle, run a system with nothing but wind, solar and hydrogen storage and a few batteries.

Do you need other types of storage? We think probably yes, but that is a question of cost. The other things could not do that long period, but there may be higher efficiencies, so they can play a role. We think you probably do need some compressed air. Some hydro will be there anyway, and so on. I don't know how long you want me to go on; I could talk about the amounts of storage and the costs.

Q246 Chair: You have given us a very good overview for the moment, so thank you. We will come back to you with some more questions shortly. Kate Gilmartin, could you give us a sense of where hydro storage sits within the envelope just provided to us by Sir Chris?

Kate Gilmartin: Yes, indeed. We have four operational pumped hydro schemes in the UK. They were all delivered over 40 years ago. We have the long-duration energy storage consultation open at the moment and we hope that that will deliver a cap and floor mechanism that can help bring forward the pipeline of projects that are being developed. We currently have 2.8 GW of pumped storage hydro and can push that up to at least 6.8 GW of new pumped storage hydro. It is all about the gigawatt hours rather than the total installed capacity, which would give another 135 GW hours.



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On Sir Chris's point about cost, we have to remember that pumped storage hydro is proven, it is reliable, it is there for 120 years, it has 80% round-trip efficiency and its supply chain is 80% based in the UK, which brings benefits for jobs and skills and so on. Also, drawing on Sir Chris's point, about 80% of wind cycles can be covered by pumped storage hydro, which are in 10 to 50-hour gaps.

It also brings things like inertia and it is a synchronised generator, so as we move to more intermittent renewables—wind and solar—and as we lose thermal generation and turbines from the grid, we need to have big spinning reserves to give that inertia. There is a lot that we can bring forward in terms of pumped storage hydro.

It is also worth mentioning hydropower. Currently, the largest amount of non-fossil fuel storage is from conventional hydropower or reservoir hydropower, about 900 GWh, and that has been powering us decade after decade. If you look at Elexon data, you can see that hydro comes on to do the morning peak and the evening peak and has done that for many decades. We have more potential hydropower out there—we estimate at least another gigawatt—and some of that will be alongside storage.

We have the contracts for difference mechanism, but unfortunately its parameters are for 5 MW and over, and no hydropower has ever come through contracts for difference because that parameter is too high. It was basically a legacy. That parameter sat next to the feed-in tariff.

We are not bringing any hydropower forward at the moment. Going back to points that other panellists were making, we have to think about the local energy solutions, distribution, storage and flexibility and about dispatchable generation at distribution level as well.

Finally, I want to mention tidal range. We have 20 GW potential for tidal range in the UK. It is a proven technology, it is a 120-year-plus asset, it is not weather-dependent, it has timetabled generation and it has a place within the question we have around resource adequacy: what happens when the wind doesn't blow for three weeks? It is all part of the portfolio that we need to be looking at, and that diversity helps mitigate risk.

Q247 Chair: You are talking there about potential capacity. The installed capacity is much more modest than the figures you have been describing. There is not a mechanism at the moment, because you do not have access to contracts for difference other than in some tidal stream arrangements. You are saying that the technology is there, but is not yet costed or in the kinds of project that we were hearing about from the first panel and that are ready to go.

Kate Gilmartin: For tidal range?

Chair: No, pumped storage hydro.



Kate Gilmartin: Pumped storage hydro—we do not have the mechanism in place at the moment to bring forward new projects. There are the four operational ones from the '60s and '70s. We are hoping that the cap and floor that is currently under consultation will give us the long-term price stabilisation mechanism that will allow investor confidence and the cost of capital to reduce to allow us to build out the pipeline that is there now.

Q248 **Chair:** Ed, could you tell us where batteries sit at the moment?

Ed Porter: Currently?

Chair: In their capacity to help to resolve the storage constraints that Sir Chris outlined.

Ed Porter: I will be happy to describe it, but first perhaps I can pick up on one point from Sir Chris on the provision of short-duration response. Sir Chris mentioned that meeting small deviations in frequency would probably be provided by battery storage. For example, the grid had a big shift in frequency on 22 December and the provision for that came from battery storage. We now have a fleet of 3.5 GW of battery storage, which is 4.5 GWh. It does not compare with pumped storage hydro from an energy perspective, but from a power perspective it is broadly similar. It provides that instantaneous or near-instantaneous response to bring grid frequency back to 50 Hz. That is a big chunk of what battery storage has been doing so far in the UK power system.

Of that 3.5 GW, about 1.5 GW is required for frequency response services—that is keeping the grid frequency at 50 Hz. The rest of it is now leaving the frequency response market and going into wholesale trading. It is charging when there is excess renewable generation and discharging when there is a peak in demand and high pricing. That is very much how storage works today.

Q249 **Chair:** What is the potential capacity for batteries? Is there a pipeline in the same way as there is for generation?

Ed Porter: There is. Going out to 2050, we are looking at about 50 GW of battery storage, circa four hours in duration. You are talking about 200 GWh of battery or electrochemical storage.

In the nearer term, we have 3.5 GW of storage today and by the end of next year, that number should be 6 GW. In fact, it should be 7.2 GW but we think it will actually be 6 GW, based on what we have deployed and the speed of deployment so far. What is behind that difference is effectively delays in connecting, delays in getting electrical staff on site and so on. You have heard a lot of that from the first panel so I will not repeat it, but they are effectively challenges in deploying new power electronics.

Q250 **Chair:** Actually, I would like you to go into that, because this inquiry is trying to understand how we make the grid fit for purpose. If it is not able this year to take on capacity that is waiting to be installed, how do



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we resolve that? What are the integration issues with the grid, from your perspective?

Ed Porter: Maybe I could provide a little bit of context. In 2012 to 2014, we installed a battery called the Big Battery in Leighton Buzzard. It was 2.5 MW. The size of the batteries going through planning now is 1 GW to 1.5 GW. That gives you an idea of the different scales that we are talking about. There is maybe a 10-year difference between those two.

If we narrow that gap, three or four years ago we were adding 110 MW or 200 MW per year. This year we are looking to add, near enough, 3 GW. We are straining the industry's ability to deliver those big projects. Ramping up an industry to be able to deliver 10 times what it was delivering just a few years ago is incredibly challenging. I am not sure that we have the qualified staff, engineers and electrically certified people to carry out that work.

Q251 **Cat Smith:** The roll-out of storage technology requires reasonably high capital costs, so I have some questions on finance for you all. Will the market be sufficient to allow investment, or will Government intervention be required? Sir Chris, perhaps you could start.

Sir Chris Llewellyn Smith: There are two market problems with storage. The first is investment. The underlying difficulty is that in a very high wind and solar system, maybe 85% of your electricity will come directly from the wind and solar farm and 15% will come from storage or other flexible sources. The first part will be cheap and the second part will be incredibly expensive. It will be expensive because whatever complements wind and solar will be meeting only 15% of demand, but when the wind is not blowing and the sun is not shining, it has to be capable of meeting 100% demand, so it is working with a very, very low load factor. This is true of whatever complements high wind and solar, not just storage. The question is: who the hell is going to build things that are incredibly expensive and only meet 15% of the need? Under the present market, they do not think they will.

That is widely recognised, but there is a second problem with big storage: there is a new interface. At the moment, when they want to meet demand, the system operator says, "We need this sort of power," they call on whatever is cheapest, in merit order, and they fill it. But there is a new problem, which is that if we see in the next hour that there is going to be a big surplus of wind and solar, which sort of store do we put it in, and who decides that? If you leave it to the market, it will be done to the advantage of the individual player, but if you want to lower the cost for the system as a whole, there must be some co-ordination for which the individual players are not responsible. That is the problem. I could say something about the solutions that are being proposed, if you want me to.

Cat Smith: I am going to come to that, but perhaps first we can hear from Kate and Ed whether they think Government intervention will be



required for the cost and financing of storage.

Kate Gilmartin: In pumped storage hydro we have the cap and floor mechanism, and hopefully a well-designed mechanism will come through the consultation. One of the things we are suggesting is that it is very closely aligned to the interconnector cap and floor. When that mechanism was being designed, they used the Nemo project as a pilot to develop the regime. We are recommending that, if Ofgem is chosen to do the detailed scheme design, it works closely with one of the project developers to expedite this process to ensure that the scheme design is fit for purpose and delivers as it needs to deliver to give certainty to investors that they will be able to build out and have a business case for those projects.

Trying to match the mechanism closely to the interconnectors will be key, but we feel confident that if it does, we will find the investment. There is competition globally for investment, especially given the Inflation Reduction Act in America. We have to move as fast as we can to make sure we are bringing that investment into the UK, because this is a global race.

I work with the International Hydropower Association on its pumped storage hydro working group, and we are slightly ahead of the game in the UK right now. People are looking to what we are doing. However, if we do not move fast, we will find that the supply chain and the investment will go overseas, and we will have a great mechanism but the projects will not get built out.

Ed Porter: I echo that we are ahead of the game. The UK grid is seen, in the evolution of short-duration storage, as being something of a leader in that space, alongside ERCOT in Texas and CAISO in California. It is quite interesting that short-duration storage has not been subsidised, and that is to some degree unique. Storage has been invested in because of the service it can provide and the fact that it can provide it at a cheaper level than thermal or carbon-emitting gas turbines in frequency response.

As I mentioned, that market has now been provided. Short-duration storage is very much moving into wholesale trading and that is the key market for it. In that market, you will get competition between players. While storage to date has not been subsidised, you have other players in that market that are subsidised. For the sake of argument, take CCUS as an example: if you were to build a lot of CCUS and pay a lot of money for it and then subsidise that from the Government, that would take away the need for other flexible plant. At that point, you either would not build short-duration storage or need to subsidise it.

This is a very difficult question to answer, because it depends on what other technologies you subsidise. The classic example in electricity markets is the electricity market reform in 2012, when they brought in CfDs—very effective—but at the same time you also need a capacity mechanism to make sure that you have both types of technology available to the systems.



Q252 **Cat Smith:** Thinking about interseasonal storage, is it possible to leave that to the market, or will there have to be some Government intervention? Are there things that the Government should be doing to address and encourage interseasonal storage? Can I go back to you, Sir Chris?

Sir Chris Llewellyn Smith: First, I don't think "interseasonal storage" is the right word. If you balance the mixture of wind and solar correctly, averaged over enough years, you can get the difference between supply and demand in the winter to match. The problem is volatility. Averaged over the years, there is no problem about winters and summers, but in some individual years there is much more in the winter and much less in the summer. I think we should ban "interseasonal"; it is the colossal volatility that matters.

To answer the rest of your question, I am afraid I have to go back and make a very important point that I should have made earlier. I said that you need to study very long, continuous periods. The modelling that has been done on behalf of the Climate Change Committee and the National Infrastructure Commission looked at individual years; it looked at several different individual years, but that makes no difference to my point. If you do that, you seriously underestimate the need for long-term storage. Obviously you cannot see interdecadal storage, but harder to grasp is that you overestimate the need for other things.

The reason for that is that if you look at a single year, the level in the store on 1 January and 31 December has to be equal. If it is bigger at the end of the year, what are you doing? If it is bigger at the beginning, you have invented a new source, a *deus ex machina*. So they are equal. Anything you put in and out of the store has to be put back again, so if you only study one year, you are only actually storing for a few months or weeks and you can only store very small amounts. What do you do? The people who have done that say, "Oh, but we looked at a year with low wind," but that is worse because there is demand to be met and if there is less wind and you are not allowing storage to bring in energy from other years, you have to have something else.

The result is that these models give too much other flexible supply. You will notice that the NIC and the Climate Change Committee have a lot of gas plus CCS or, God help us, burning blue hydrogen to make power. They get too much of that because they have studied only short periods and they have not recognised the need for this very large amount of long-term storage.

I have spoken enough. Do you want me to go back to markets?

Q253 **Cat Smith:** Is there anything by way of a recommendation that the Committee should be making to the Government about reforms that you think would be useful?



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Sir Chris Llewellyn Smith: DESNZ has a consultation out on markets at the moment, but those raise very many questions for me. These are personal questions; I have not discussed them with the Royal Society. For other things I have said, I can blame the Royal Society.

First of all, DESNZ has analysed separated blue hydrogen to power, electrolysers to hydrogen to power, and what they call long-duration storage, which does not include hydrogen, but all those things are fungible, so I simply cannot see the logic of studying those things separately.

The second thing is that all the modelling has looked at individual years, so they get too little of electrolysers to hydrogen. Then they have gone to economics consultants and said, "On the basis of this modelling," which I personally question very deeply, "tell us what market mechanisms would work." The economic solutions may be right but I am worried about the incoming assumptions. They come up with a dispatchable power agreement for blue hydrogen and a cap and floor for storage other than hydrogen. These are out for consultation at the moment.

On the capacity market, the DESNZ consultation says that they do not like the idea, and they do not like it for quite good reasons. They say these storage technologies are very expensive, so if they are in the capacity market there has to be a very high clearing price in the auction, which means that the other people who are in the capacity market already would make unreasonable profits. Then they say, "Oh, well, we could separate the capacity market," but there would not be enough bidders in the storage market so you would not get the competition, so they do not like that.

I am not convinced by any of those things. Also, these analyses are made—I quote from the DESNZ papers—"in the context of existing business models and support packages". I personally think we will have to be more radical than that, first to think about this operational problem. On the other problems, we may end up wanting a nationally supported strategic reserve for hydrogen or something like that.

I do not know the answers. We make some proposals in our report to stimulate the discussion, but it needs more radical thinking. There are nice things there, but they are all working from present ideas. We need to step back and think more fundamentally.

Cat Smith: Kate, you are nodding. Is there something that you would like to add?

Kate Gilmartin: Yes. On the point that Sir Chris made, we tend to think about everything within our current mechanisms. Actually, we have to think harder about what our grid will look like in 10 or 15 years' time. Often we talk about capacity markets and we think about meeting peak demand, but what will peak demand look like in 10 to 15 years? I often



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use the examples that if we decarbonise 6 million terraced homes, you get 12 GW of embedded flexibility within that solution itself.

In talking about policy gaps and blind spots, those 6 million terraced homes that are two to three-bed are currently falling outside the boiler upgrade scheme will not be able to put in an air-source heat pump because there is not enough external space outside and they are unlikely to be part of the centralised heat network. We have to look at the whole system approach and stop siloing with storage, flexibility and smart systems. We have individual competitions across these different silos but these are whole-system solutions. We have to start thinking about the future grid, what it will look like and how we will balance. Will we have the big teatime demand? If you have smart local energy systems, maybe we will not, because we will have preheated our homes until 4 o'clock and then we can incrementally heat them at 10-minute intervals across a street. We need to think about a very different system.

As was picked up earlier on recommendations to Ofgem, we need to innovate a lot faster and harder. We need to digitise the grid a lot faster. We have a lot of spare capacity in the grid; it is just that nobody can see it because it is not digitised. It is analogue, so you cannot see across the transmission and distribution grid supply points. I think that Chris made the point earlier that we are not really sweating the assets. We could do a lot more to do that by Ofgem pushing down on the DNOs and giving them quotas around how many innovation projects they need to take on. There is a strategic innovation fund, but many DNOs do not have the human resource to do more than two projects a year, when really we need at least 20 projects a year for each DNO.

There are some great innovations coming through that get to this hard stop because they are not being brought through the competitions. Competitions take a long time to deliver. We go from discovery to alpha to beta over a three to five-year period. All that needs to be sped up, and we need fast-track pilot projects to help us use the assets we have already.

Q254 **Cat Smith:** On storage solutions, are you able to say something about how the Government could potentially support storage and flexibility in buildings? Is that something you know about?

Ed Porter: We focus on things that are bigger than, say, 6 MW. To give you a context of size, that is typically a small field with some containers in it, so it is grid-scale storage. On battery storage in homes or at the domestic level, I think that the point Kate makes is a good one. It also applies to EVs. As soon as you can have a power price that encourages people to make the investment in the technology themselves, you will see them start to react to that and make their own investments. That is a powerful thing because it is part of a network that is hard to see in any other way. If you have very clear power pricing, you can have people choosing to invest in storage in their own homes. That can help to solve some of the problems you have at the distribution and network level.



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Q255 **Chair:** I will come back to you, Sir Chris, on your comment about the CCC analysis. I think you said because they only looked at one-year intervals for their storage calculations for wind in particular or wind capacity—

Sir Chris Llewellyn Smith: For the whole system, yes.

Chair: Does that, in your view, undermine their model?

Sir Chris Llewellyn Smith: With the modelling done by the CCC, which was behind “Powering up Britain”, I do not trust the numbers in detail but I think that the proposed solution has a good mixture of things in there. By looking at only one year, as I said before, you cannot see this very large interdecadal storage, but the other side of that coin is that you find you need something else. They have more gas plus CCS than I think we will need—I would prefer to have none, actually—or burning blue hydrogen.

By the way, in these analyses—you have me on a hobbyhorse here, I am afraid, Philip—they put in a cost for carbon. However, if you are using gas or CCS or to make blue hydrogen, you cannot afford methane leakage. It is a very potent greenhouse gas. It should be costed and it should be done properly. The wrong measure is used. This is a technical thing. The impact is underestimated. Following the IPCC, people have put the impact of a pulse after 100 years. I am not interested in 100 years. We want to be out of this mess by 2050. Secondly, who is talking about a pulse? We are talking about building a new power station that emits continuously. That gives a much bigger effect. The right so-called equivalence factor—they are not equivalent—between CO₂ and methane is that, per tonne emitted, methane has an impact 128 times bigger on the temperature in the first 20 years.

As I said, I think the amount that has been put in is bigger than is needed; I would rather see it go to zero. I think that CCS should be reserved for things in industry that we do not know how to decarbonise otherwise. I think we can decarbonise electricity without having CCS.

Q256 **Chair:** Unfortunately you were not on the panel with the representative of the industry, because we could have had an interesting debate.

Sir Chris Llewellyn Smith: I could not hear what she said. By the way, I would like to pick up on something—I am sorry, you keep provoking me. She talked all the time about CCUS. You should always ask, “What do you have in mind by U?” It sounds terrific: “We use this stuff.” The only large-scale use I know is enhanced oil recovery. Who wants that? After that, we are into making fizzy drinks.

Chair: Thank you. A nice segue for Claudia Webbe.

Q257 **Claudia Webbe:** Indeed. I am talking about energy security now. What type and level of low-carbon storage would be required for us to be sufficiently resilient in our energy supply without the need for carbon-



based generation?

Sir Chris Llewellyn Smith: I do not know the answer to that. We put in contingencies on the assumption, which the Met Office has told us is all right, that there will not be large changes in wind and solar as a result of climate change. That is not a theorem. There could be bigger changes than they think. The Met Office told us that climate change will increase the volatility but by less than the existing interannual volatility. If that is correct, by using historical data with existing volatility we are all right, but we added 20% contingency.

I do not know if 20% is enough. You will build the contingency last. You will use whatever you have built. By the time we get to the last bit—I am thinking about a large hydrogen system—we will understand the climate better, we will understand all the modelling and we will know. You could certainly make enough to make it okay. Whether it is 20%—that does not make that much difference to the cost but it makes it much harder to build it in time.

Kate Gilmartin: Recently, the LCP Delta region report suggested that 20 GW of long-duration energy storage by 2050 would result in savings across the network of £24 billion. I always tend to point to the future energy scenarios that, when the ESO becomes the FSO, will hopefully be the future energy pathway. That is a great piece of work that is reviewed every year. It maps out what we need to do and how much we need of different things.

I go back to the whole system portfolio approach. I think that we are missing out the fact that we need to have flexibility, optimising and balancing at different levels of the grid. Everything is very focused on mass generation connected at transmission level. We have to do more around the distribution network, local balancing, local optimising and storage and flexibility.

There is also the rural grid. There is a big policy blind spot in how we decarbonise rural communities. I tend to point to the broadband roll-out. Market solutions always deliver where the market will make the most money. Rural communities got left behind with broadband. There is a big risk that we will not decarbonise the weakest part of the grid in rural areas. I think that it is a case of having plans for transmission connected, but also distribution and local as well.

Q258 **Claudia Webbe:** Do you think that the Government are taking seriously enough the energy security benefits of the growth of clean energy supply?

Sir Chris Llewellyn Smith: I imagine that they are taking it seriously. After all, their Ministers are in the line of fire if the lights go out. On the other hand, they are not responsible for what will happen in 2040. It is a concern. As I said, "Powering up Britain" has a lot of things that I do not



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agree with in the details and the numbers, but that is obviously taking energy security seriously. I think that it is being taken seriously.

Q259 **Claudia Webbe:** Not so much taking energy security seriously, but taking the energy security benefits of the growth of clean energy seriously.

Sir Chris Llewellyn Smith: Yes. Maybe, maybe not, if we can free ourselves from imports. We will be relying on Norwegian gas before long. Will it be there?

Ed Porter: This is a good point. In a few of the last responses, we have talked a lot about CCUS and hydrogen. Those are future techs. We have not seen them being deployed commercially at the scale we want to see them deployed at. One recommendation I would make is that before you make decisions around how to balance the grid in 2050, you set up stage gates where you see these techs turn up in the scale that they claim to be able to do, and deploying in commercial volumes. That is absolutely critical. If you want to build a grid in 2050 that will rely on something that has not yet been commercially proven, you should be very nervous about making that assumption. That is point one.

To your question, we may be discussing what is challenging in 2050 but we are not discussing a more important thing, which is how you drop carbon emissions near-term. It is good to talk about CCUS and hydrogen for the occasional two weeks in 2050 where we might not have power generation, but I think that right now we should talk about how you get carbon emissions down as quickly as possible. It is not just a UK thing; it is happening in lots of other grids worldwide. The answer to that is to deploy as much solar and wind as possible and as quickly as possible. Then you use proven techs such as battery storage—it does not have to be lithium, it could be other electrochemical storage—to solve that problem and to deliver lower carbon grids sooner.

Kate Gilmartin: I equate energy security with resilience as well. We talk a lot about indigenous generation and growth. We are an island nation. We have tidal and huge amounts of potential to become an energy exporter. I do not think that is taken seriously enough. We do not have policy around tidal range, for example. We do not have policy around small-scale renewables under 5 MW right now. All of the distributed generation connected at the local level is jobs, skills, growth and resilience to communities. It is about affordable energy as well. There is a big gap in policy for local energy markets. We have talked about time-of-use tariffs and people shifting, optimising and balancing. That is what a smart grid will look like. If we can work from the grassroots up at community level, we are bringing jobs, skills and affordable energy to people at the same time as meeting energy security and local resilience.

Q260 **Claudia Webbe:** What is your assessment of how energy security is featuring in Government decision making, particularly around renewables?



Sir Chris Llewellyn Smith: I am not sure I know the answer to that. They certainly have targets for more renewables, but we need to go faster on them and we need to go faster on other things. There has been a lot of very large-scale hydrogen storage, by the way, in Texas and the UK and things like that. There is no question but that it can be done, but they are not pushing fast enough to do it. We find out—and this was your point—what it really costs and, by learning, start to get the costs down. To my mind, that is the most critical thing.

In recent announcements, there has been a lot of encouragement for using hydrogen and for electrolyzers, but if the Government say that they will build a terawatt-hour or something of hydrogen storage, by the time it is built there will be people queuing up with electrolyzers because they will be needed. That will trigger the whole market. I do not think that has been given enough priority. That would get us moving—that and the other things such as strengthening the grid that have to be done starting now.

Ed Porter: On energy security, relying on global grids, we have a capacity mechanism that is essentially procuring exactly that capacity and we have contracts for difference that procure more renewable generation. Those are procuring low-carbon generation and capacity. They are not necessarily seeking to get us energy independence away from other markets. To be honest, that is not being actively pursued in how the market works today. It is a huge benefit of procuring more renewables, though, so they are closely aligned.

Claudia Webbe: I suppose I am asking you questions that might lead you into critiquing or criticising the Government. I can see the resistance to doing that. Let me ask one other question—sorry, Kate, did you want to come in?

Kate Gilmartin: I was just going to say that I find that Government tend to think that markets will deliver, and I always say that the grid is physics. It is difficult to find a market mechanism that will deliver an operable, stable, decarbonised grid. There is also a mantra around technology agnosticism. Actually, the future energy scenarios and the future energy pathway are not agnostic. We need different technologies to do different things because they all do something different, they all have a different generation profile. Again, also, I think the mantra of levelised cost of energy is a blunt instrument. Tidal range has not happened because Swansea Bay was deemed to be too expensive, but it is a narrow focus of what localised cost of energy is and does not take account of assets that are there for 120 years.

I would like the Government to be more agile and dynamic. I think that we are seeing that with the contracts for difference being annual and the consultations on how they can tweak things, but we need to have an agile, dynamic Government if we are to get where we need to get to, with an understanding that the market will not deliver everything for us. We have to be a bit directive about how that happens.



Ed Porter: Could I add a point on those two things? First, levelised cost of energy and levelised cost of storage are blunt instruments. Kate is absolutely right. When you look at power prices, half-hour by half-hour in, say, 2040, there are days at a time when the price is zero and there are days where you have, say, £3,000 pricing. Being available to operate in those different windows has very different value to the UK grid and to consumers. You should be careful in seeing a levelised cost of energy or a levelised cost of storage. It is about when it turns up. That is the important part.

The other part is on being non-technology agnostic. This is a good example of the pumped hydro and electrochemical storage. Historically, electrochemical storage has been half-hour in duration. That is typically where it would be. Right now, it is getting towards two hours, and in the future we think it will be four hours. If the cost of lithium systems—it can be any electrochemical, but lithium just happens to be the tech that is cheapest at the moment; it might be sodium-ion in five years' time—comes down, that could easily put it into the range of doing eight hours or 16 hours, which starts to come across some of the range. We have pumped hydros active.

In difference to what Kate said, if we are procuring things, we should be clear about the thing that we are procuring and then the market will put forward a good response to that. It is hard to pick a tech and then say, "That tech will be the right one." It is also dangerous from a cost perspective. We should be clear about the thing we are trying to get and then let the market decide which is the right solution.

Q261 **Claudia Webbe:** The Government's "Powering up Britain" energy security plan was launched in March 2023, I think. What impact do you think that has had on the market? Has it had an impact on the market?

Sir Chris Llewellyn Smith: I have no idea.

Kate Gilmartin: It has not helped hydropower. As I mentioned, the parameters in the contracts for difference are unsuitable, and it has not brought forward local energy and smart local energy systems. There is a gap in what it needs to achieve. Also, the big target numbers do not take into account generation profiles. We can keep going with more solar and more wind. We will hit the same constraints issues and will still have the same resource adequacy issues as well. It needs to be more nuanced, and Government need to be more agile.

Q262 **Dr Offord:** We understand that there needs to be a significant increase in the roll-out of low-carbon storage capacity. What is the likelihood of that being achieved in the United Kingdom?

Sir Chris Llewellyn Smith: I did not hear the last part of that.

Dr Offord: How likely is it that the roll-out will be achieved?

Sir Chris Llewellyn Smith: How much has been achieved?



Dr Offord: No. We know that there needs to be an increase.

Sir Chris Llewellyn Smith: It will need what is happening in the US, for example. Under the Inflation Reduction Act, a very large hydrogen system is being built in Utah with many electrolyzers and so on. That sort of thing is happening in Germany. It will not just happen out of the blue. I talk to plenty of people in this business, such as INOVYN, who have a planning permission to make a very large cavern in Cheshire, which they have firstly for methane and natural gas. For hydrogen, they say, "We would love to do it, but there is no business case."

Getting the market and the incentives right is vital, and at the beginning, maybe subsidies. I agree with what you say to a certain extent about leaving it to the market, but you cannot avoid the fact that there will be a need for very large-scale long-term storage. Hydrogen is the only option, actually. You cannot leave the market to decide. If there is only one option, you have to do it.

Ed Porter: I echo the point about inter-seasonal storage. The market is good at deciding what to generate where and essentially how much we should build in the five to 10-year timeframe. The market is not pricing in managing wind deviations across three to four years to turn up for a two-week period when we need it. We also have caps on market price, which is a reasonable thing to have, but it would not be sensible for someone to build a hydrogen peaker to turn up for two weeks of the year. As a business case, that would not work. If the market will not incentivise that but it is the best option we have available to us, another mechanism needs to be looked at to have that available to us.

Q263 **Dr Offord:** Another mechanism needs to be looked at. Where are the Government in that mechanism?

Ed Porter: Good question. People are looking at a variety of options here. It is true of the energy market constantly that we are looking at lots of consultations all the time, perhaps too many. The overriding thing that I would call out on this is that whatever mechanism is chosen allows the market to function in a way that means it is unimpacted by this. If you want to deal with the inter-year problems that Sir Chris mentioned, it is important to make sure that you are doing so in a way that does not impact price in day-to-day systems. That price is important for allowing people to invest in short duration storage, to allow their EVs to charge up at a low price and to choose to make an investment in a battery storage system in their own home. You need the market price discovery to exist and you want to deal with strategic issues like that outside of the market.

Q264 **Dr Offord:** Where is Ofgem in all of this? I surmise that you feel that the Government are not supporting you enough, but Ofgem has a role in increasing the capacity for low-carbon storage.

Kate Gilmartin: I spoke earlier about how Ofgem has run the cap and floor for interconnectors and with pumped storage hydro. The



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consultations are open at the moment and we will put forward to say that we would like Ofgem to do the same with pumped storage hydro. It is worth noting that the last four pumped storage hydro projects were built over 40 years ago under state ownership. There are 12 projects in the pipeline, but these are huge civil infrastructure projects. It should be supported fundamentally by Government in how we complete these projects and deliver them on time, on budget, to give best value to consumers.

Pushing back on this “market will deliver” attitude, we need to have a partnership approach. There are only 12 projects there. Ofgem should know exactly what those projects are. It should be over the detail of each project, looking for red flags, looking to enable projects, rather than this standing back and letting the market deliver. I hope that Ofgem will have a collaborative approach in how we look to deliver.

Q265 Dr Offord: Again, I surmise from what you are saying that the Government are not working collaboratively across Whitehall with, for example, not only the Housing Department but DESNZ. Is that what you are saying?

Kate Gilmartin: I think that they are collaborative. The fact that we can all jump on Teams these days has broken down a lot of barriers in how we work with our civil servants, but there is always a push: “Here is our mechanism, you go and deliver.” We need to work more collaboratively and strategically together. Hopefully the FSO will be part of that as well. We have regional energy systems planners coming in through the FSO. I think that it is a case of all working together to achieve the common objective, rather than “Here is a mechanism, you go and deliver.”

Q266 Dr Offord: I know that time is pressing. Finally, the issue about such large-scale projects has been particularly difficult in other areas of the United Kingdom in different sectors. What are the significant barriers in the planning process to achieving this?

Kate Gilmartin: I think a lot of the 12 projects I mentioned are going through the planning process. As with all areas of public service, there have been a lot of cuts and we are seeing a lot of delays and churn of staff, where you lose the institutional knowledge. If you do not have the knowledge, you are more likely to say no, because otherwise you might get blamed for saying yes. I think that we need more resources going in to help support these projects and speed them up. As we all know, we do not have time to wait.

Dr Offord: There could be greater co-ordination in some Departments.

Chair: Kate, could you send us a map of the 12 locations for the pumped hydro storage? We have them for other things, but not for that.

That concludes our panel. I would like to thank our panellists—Ed Porter, Kate Gilmartin and Professor Sir Chris Llewellyn Smith—very much indeed.