

Environmental Audit Committee

Oral evidence: Technological innovations and climate change: onshore solar energy, HC 856

Wednesday 11 January 2023

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[Watch the meeting](#)

Members present: Philip Dunne (Chair); Barry Gardiner; James Gray; Helen Hayes; Ian Levy; Caroline Lucas; Jerome Mayhew; Anna McMorrin; Dr Matthew Offord; Claudia Webbe.

Questions 1 - 95

Witnesses

I: Chris Hewett, CEO, Solar Energy UK; Ian Rippin, CEO, Microgeneration Certification Scheme; Professor Alastair Buckley, Professor of Organic Electronics, University of Sheffield; and Dr Chris Case, Chief Technology Officer, Oxford PV.

II: Dr Alona Armstrong, Senior Lecturer in Energy and Environmental Sciences, Lancaster University; Judicaelle Hammond, Director of Policy and Advice, Country Land and Business Association; and Paul Miner, Head of Planning and Policy, CPRE The Countryside Charity.

Written evidence from witnesses:

[Solar Energy UK](#)

[MCS \(MCS Service Company Ltd\)](#)

[The University of Sheffield, Open Climate Fix, Exawatt](#)

[Oxford PV](#)

[Dr Alona Armstrong](#)

[Country Land and Business Association \(CLA\)](#)

[CPRE the countryside charity](#)



Examination of witnesses

Witnesses: Chris Hewett, Ian Rippin, Professor Alastair Buckley and Dr Chris Case.

Q1 **Chair:** Good afternoon and welcome to the Environmental Audit Committee for a one-off hearing in our framework investigation into technical innovations and climate change. We are looking today at onshore solar energy. We have two panels present, and I am delighted to welcome our first set of panellists. Starting from my left with Professor Alastair Buckley, it would be very helpful if you could introduce yourselves and where you are from.

Professor Buckley: I am from the University of Sheffield, and my role at the university is to provide solar outturn monitoring to National Grid, the system operator.

Chair: Thank you. We are also joined by Dr Chris Case from Oxford PV.

Dr Case: Correct. I am the chief technology officer at Oxford PV. We are the company based in the UK that is developing this novel perovskite-based solar cell.

Chair: Does that stem from work at Oxford University? Is that the clue in the title?

Dr Case: It is a spin-out from the University of Oxford, co-founded by Professor Henry Snaith—I think he is the youngest FRS, by the way.

Chair: Thank you. Chris Hewett from Solar Energy UK.

Chris Hewett: Solar Energy UK is the trade association that represents the solar energy storage industry. We have around 340 members now across the whole value chain of the industry.

Chair: Thank you. Ian Rippin from the certification organisation.

Ian Rippin: That is right, yes. I am chief executive of the Microgeneration Certification Scheme, MCS for short. We are responsible for the industry standards and certification schemes for both products and their installation—small-scale products like solar panels.

Q2 **Chair:** Excellent. I will start with a very straightforward, scene-setting question, which I would like each of you to comment on briefly. The Government have set a clear ambition to achieve a significant increase in energy generation from solar panels by 2050 to meet net zero Britain. I will start with you, Chris. Do you think that this is enough, and is it feasible?

Chris Hewett: It is definitely enough. We could probably deliver more, but it is certainly feasible. Solar is the most popular energy and electricity generation technology in the country. It is the cheapest, alongside wind, and it is also the fastest to deploy. Those are some of the reasons why it



HOUSE OF COMMONS

is important to focus on that. I have a few initial comments on some of the barriers that are being thrown up at the moment, if you don't mind.

Chair: We will get on to quite a lot of barriers, so keep it high level.

Chris Hewett: Yes. There are a couple that I know are not in the questions, so perhaps I will focus on those.

There is a real energy security and climate change benefit, as well as all the economic growth potential there. We think that 70 GW will probably get to about 60,000 jobs in the UK. We think that the investment is there to deliver that in the next few years to get on that trajectory.

There are a couple of things that have come from the Government that have disappointed us. We know the potential of the renewables sector and solar in particular. The electricity generation levy, which has just been introduced in the Budget, will levy a windfall tax, effectively, on the solar and wind sectors. That is a perfectly reasonable thing to do. If there are surplus profits being made, we as an industry are perfectly willing to contribute, as long as there is a level playing field. It does feel like the Government have not set that level playing field now. The oil, gas and coal generation sectors are exempt from that levy, so we feel that is a real mistake.

The other difference between the fossil fuel sector and the renewables sector is that, while the oil and gas extraction sectors also have a windfall tax—it is slightly lower, but it is a windfall tax—they have an allowance for investment, so if they invest in technologies, they can offset that against the tax. That allowance has not been offered to the solar or the wind sectors, so that feels like unlevelling the playing field at exactly the wrong time for the renewables sector.

The other one that I will mention—which I know will come up in the second panel, but there are no questions for this panel—is around food security and land use. First of all, if we reach that 70 GW target, we know that the land used by solar farms, even if it was 50 MW of solar farms, will be less than 0.3% of land in the country, which would be equivalent to slightly less than what is used for golf courses. It is a significantly small amount of land. It is not really going to impact on food security, so that is not an issue.

The popularity of solar farms in the country is very strong. We did opinion polling on the popularity of solar farms in the country. Those people who self-identified as living near a solar farm were eight times more likely to have a more positive view of the technology after it had been built than to be more opposed. There is a lot of fear about it from some sections of the population—a very small section—but even those who live next to—

Q3 **Chair:** Did you do that polling both before and after the installation?

Chris Hewett: It was done recently. It was done last year, and it was people who were self-selecting—



HOUSE OF COMMONS

Q4 **Chair:** Did you go back to the people who were expressing a view before there was an installation and then after the installation?

Chris Hewett: We asked them to say whether their view of the technology has changed since the solar farm had been built, and eight times more said they were more favourable than more opposed. The numbers opposed were very small. That is one thing to say.

The other point to make on food security is that the National Farmers Union has given your Committee evidence to say that it is very comfortable with the 70 GW target and they don't see that it would disrupt food production at all. You may want to take it from us, but certainly if you take that from the NFU, that seems to be a very reputable source of reassurance.

Q5 **Chair:** Would you be surprised to hear on your first point that I was approached by an installer directly before the energy windfall tax was expanded to say that there was an inherent unfairness that established solar farms and other renewables that had been set up were benefiting from enormous windfall gains as a result of price changes and that it was fair if they were subject to that tax regime?

Chris Hewett: Yes, we have no problem with the windfall levy as it is structured for the solar sector. Our problem is that it is not structured in the same way for fossil fuel generation, and we do not see the reason for that—there is no logic.

Chair: We commented on that in a report we published last week.

Chris Hewett: Excellent.

Q6 **Chair:** Thank you. That was very helpful. Ian.

Ian Rippin: From MCS's perspective, solar PV is the success story of microgeneration. Since 2008 there have been over 1.2 million installations of solar PV. It is very accessible technology. To put that in perspective, that is over 3 GW of power on people's roofs, which is equivalent to Hinkley Point C. We are seeing tremendous interest in solar PV. In 2021, there were 61,000 installations under the MCS scheme, and there were 138,000 in 2022. We see no reason why that growth trajectory will not increase, driven in large part by the price of electricity and people wanting to do the right thing by the environment.

Q7 **Chair:** Is the adoption in the UK of solar PV much slower than it is in other countries on the continent?

Ian Rippin: It is, I think, although it is in the consumer psyche now. I think that people understand the benefits of solar PV and the fact that it can be linked with other technologies to green their energy use.

Q8 **Chair:** Alastair, could you give us an academic perspective on the achievability and adequacy of the target?



HOUSE OF COMMONS

Professor Buckley: Yes. I completely support the 70 GW as a sensible target. That would provide about 10% of the electrical energy requirements from 2035 onwards.

It is worth reflecting on what currently is provided by solar. As Ian said, solar is a success story. Currently, about 4% of the electrical energy requirements of Great Britain are provided by solar, and the peak generation from solar is about 30% on a summer day for electrical energy. It is worth reflecting also that the 70 GW target is consistent with electrification of heat and transport. We are looking at a doubling in electrical energy requirements by 2035 to 2050 timescales.

While the pipeline for generation from renewable sources is strong, some of the other required developments, in the electrification of heat in particular, particularly for domestic dwellings, are not necessarily keeping up with the generation being provided. I think that the Environmental Audit Committee recently published a report on the fuel's progression that cited this point precisely—that energy efficiency in homes should be a policy focus. It is worth reflecting that the two things have to go side by side. And if we do not have the demand for electricity, overproducing from renewables obviously does not make a huge amount of sense.

Q9 **Chair:** Is the technology there to heat homes from solar?

Professor Buckley: The technology is there to heat homes from electricity using heat pumps, but you have to have an insulated home and a leak-free home—a draft-proofed home—before you can install a heat pump and for it to work effectively. There is almost a prerequisite to electrification of domestic heating, which is to properly insulate homes and to draft-proof them. That is maybe the component that is falling behind at the moment.

Q10 **Chair:** The sun shines least strongly during the winter, when you most need to generate the electricity to heat the home. This is perhaps also a question for Chris. Are we seeing advances in technology that are improving the efficiency of generating electricity from solar, given where we are geographically around the planet? I am concerned that we have a relatively short sun period during the winter.

Professor Buckley: The solar is part of an energy system, and 10% contribution from solar into electrical energy is the most cost-effective price point for solar. If you are trying to rely on solar 100% of the time, that would not make a huge amount of sense, but at 10% that is a sensible contribution from solar. That is the kind of target that we should be aiming for.

Dr Case: First, I will address your initial question about the target. Absolutely, the target is appropriate, acceptable, reasonable and achievable. However, I would personally say: set an even higher target. Ultimately, long term, the future should be entirely electrically driven. That is the long-term goal for an economy and a sustainable future.



HOUSE OF COMMONS

We can also remind ourselves that less than 10 years ago the UK was the No. 1 installer of solar in Europe. For those years, around 2014 to 2015, there were very strong installations, and then a complete drop-off. The first pick-up was just this past year or so, in 2020.

Q11 **Chair:** To what do you attribute that?

Dr Case: Changes in the tariffs and the contributions of the feed-in tariff structure. I think that now we need to go into catch-up mode to achieve that target. The technology that we are developing at Oxford PV addresses one of the questions you brought up: could you generate more electricity from these solar panels and solar cells? That is exactly what we are doing with this perovskite-based technology.

This is this stuff, by the way—I brought an example. It is an extremely effective solar-absorbing material, and it is being developed as an addition to the existing solar cells that you see everywhere. I have brought one of those too. You will recognise these on all the roofs and out in the fields. These have a maximum efficiency of about 25%, and you can convert 25% of the sun's energy into electricity. With the addition of this material and the development from our company, you can raise that by 20% or even more, generating more electricity from the same space. Of course, that is critical when you have restricted land use or rooftops.

Q12 **Chair:** I would like to congratulate you for being, I think, the first witness in my five years on this Committee who has been able to get in a commercial in the introductory remarks. Is the product that you have illustrated in that little vial a film product? How does it get deployed?

Dr Case: It starts as a liquid or in some other form. Ultimately, it is deployed as a very thin film. It is very thin; it is less than one micron, which is about 1/200th the thickness of the ordinary silicon solar cells that you see everywhere. That is what makes it such a good material. It can be as effective in a very thin layer.

Q13 **Chair:** Can you put it on glass?

Dr Case: Yes, you can put it on glass.

Chair: Can you see through it?

Dr Case: Ultimately, you have to be able to see through it because the photons have to come through it to reach the devices.

Q14 **Chair:** We will get into film a bit later on, but that is very interesting. Thank you. Colleagues are looking at me as though they want to come in, but I am going to move on quickly, unless somebody has a pressing question.

Alastair, could I ask you about the contributions relatively between rooftop, ground-based and floating solar? I gather that there are some innovations to use reservoirs as a location for solar.



HOUSE OF COMMONS

Professor Buckley: At the moment, about two thirds of solar is ground mount and about one third is roof mount, shared between residential properties and commercial or industrial properties. Going forward, we would expect to see a similar kind of distribution. We will need solar generation from all different locations.

I have seen developments on floating solar. For the UK, we do not have so many—

Chair: I think that Thames Water has made—

Chris Hewett: There are one or two that were under the subsidised regime. There is definitely going to be some floating solar deployed, not least by the water sector in the next five years. I couldn't tell you exactly when it will happen, but it certainly will. There is quite a lot of floating solar deployed across the rest of the world, particularly south-east Asia, but for now and for the next 10 years or so the majority will be about two-thirds ground mount and about one-third rooftop.

Q15 **Chair:** At this point, do you think the target can be achieved using roughly similar proportions of deployment and not relying on this innovation that Dr Case is promoting?

Chris Hewett: I think that the innovations will start to dovetail a little, and maybe post 2030 we will start see the innovations become scalable. When this takes off, it will be an absolute leapfrog for the industry, and there are other leapfrogs out there as well.

Going back to the point about why there was a spike in deployment in 2014 and 2015 and it dropped, the economics were not quite there. It needed a subsidy until 2019. The subsidy was taken away. There are issues around how it was done, but that is history. Now the economics are absolutely there, so the market growth that Ian has talked about is simply on the economics. That was happening before the energy price crisis. With the energy price crisis, and the spike in the price of gas, we are seeing huge demand for residential and commercial rooftop solar as well as the investment case for—

Chair: Without the need for Government subsidy of any kind?

Chris Hewett: No subsidy required.

Q16 **Chair:** Excellent. Thank you. This is the final question from me before we move on. The target is to achieve 70 GW by 2035. The Committee on Climate Change has called for a further target beyond that. Do any of you have advice to the Committee about what would be an appropriate target beyond 2035? Have you thought about it?

Chris Hewett: I do not think that we should be picking a number. It is absolutely certain that there will be an awful lot more solar post 2035. The economics now are making it the cheapest generation source out there. It is clearly going to get better, and new technologies will be



HOUSE OF COMMONS

coming through. Solar globally really started as a proper industry in 2010—12 years ago—effectively as a scalable industry, so it is very hard to project what might happen in 2050, other than that it will be a hell of a lot. The interaction in the UK with wind and energy storage will be crucial to all that.

Chair: Thank you. I am going to bring in Anna McMorris, but just before I do, Barry Gardiner has a small supplementary question.

Q17 Barry Gardiner: Very quickly, in response to what you were just saying, does it make sense to have a gigawatt target, given that it may well be that the growth of the use of electricity in this country, the demand for electricity, may increase in such a way? Would it not make more sense to have it as a percentage of our electricity demand, certainly post 2035?

Chris Hewett: Possibly, yes. That is a good question. I hadn't considered that. For planning and industry growth and planning infrastructure required to grow solar—we will get on to grid in a moment—having that gigawatt target is useful for the next 10 to 15 years. That tells the DNOs, the National Grid and policymakers what will be required to enable those technologies to come in. Post that, I agree that the percentage is the key thing. I think that maybe 10% is conservative; we may be hitting more like 15% to 17%.

Dr Case: The IEA has made statements about 2050, setting targets of as much as 50% generated by electricity, by PV-type things, and I think that those are very appropriate minimum targets to go for. The concept of transitioning from a fixed target to a fraction makes sense, but over the longer horizon.

Q18 Barry Gardiner: That would not all be self-generated within a country; it would be by interconnection as well?

Dr Case: Any way it has to be distributed.

Chris Hewett: What we do know about solar is that it has always overperformed the projections made for it by any Government body, including the IEA, by some distance.

Q19 Anna McMorris: I am going to move on to the grid connection and the capacity for expansion as well with that. We heard through written evidence that getting cost-effective and timely grid connection is one of the biggest barriers and also that those who have received connection agreements for this year or next year are being told that they have to wait until 2028, even 2032. What do we need to be doing? What are the solutions for this? What do Government need to be doing? I will ask Chris Hewett first.

Chris Hewett: Yes, it is an issue that is rowing up the agenda, not just for the utility-scale solar farm projects but also for the rooftop sector. It is starting to hit across the piece. The core issue is the way that we manage our network. The way it is designed and the way that the



connection queue system works was designed for technologies that are 20 years old. We now have a completely different power sector, so the way we do it is not fit for purpose. It will take some time to address that.

There are a few short-term things that you can do without changing the law. In terms of the way DNOs and the National Grid tend to treat connection agreements, they all get reserved, so there are an awful lot of people who have connection agreements signed up. There needs to be a little bit more scrutiny about exactly how many of those projects will be delivered, because not all of them will be. It is a bit like a restaurant booking system: someone books a table. When you phone up and say, "I would like dinner tonight," there are no tables available, but actually one of those tables is not going to be used. That is happening in spades across the connection sector at the moment. That is something that can be looked into.

There are also ways in which the network providers, again DNOs and National Grid, assess that capacity and how they treat the different technologies. They are not really looking at them as they work on the ground. Solar and wind are variable technologies. Battery storage gets used at different times. You hear of network providers giving a connection offer, saying, "We assume that the battery will be exporting at maximum capacity at the same time as the solar is at the maximum capacity". That is never going to happen in the real world, but that is the sort of safety measure that they put in. There are ways to address that. Similarly, batteries are exporting at different times to what is assumed by the network providers. That is one of the problems.

One other issue on the rooftop side is that, again, we hear examples of DNOs saying, "You will need an export limiter on that." If the network cannot quite handle the amount that you could export at certain times, it will need to be able to limit that, which is fine. You also hear of them saying, "But we have to set safety constraints." Effectively, the assumption is that the export limiter will not work. Again, they are really overdesigning—gold-plating, if you will—what is required for those connection agreements because it was all designed for fossil fuel, when you could just turn the taps on and off.

It is a whole new way of dealing with it. Some of it is quite techy and micro, and some of it is a lot more policy led, but we will get on to the policy stuff later, I guess.

Q20 Anna McMorris: Professor Buckley, do you want to comment on that?

Professor Buckley: I was speaking to the networks lead at National Grid ESO last week. He was explaining that there are already quite a lot of activities going on with the networks to alleviate this issue in the shorter term. Some of those are about reassessing the capacity that batteries need authorising on to the network and queue management systems. They are looking at how to implement that to check that developments are progressing.



Anna McMorrin: And co-location?

Professor Buckley: Yes, co-location is happening. There is 50 GW or something of contracted co-located capacity out to 2038. Co-location is something that is happening. It is just the way that the networks agree to that and how they assign capacity to it that needs to change. That is changing a little bit.

Q21 **Anna McMorrin:** Does the co-location need to be more incentivised?

Professor Buckley: It does not really need to be incentivised; it just needs to be managed appropriately within the decision-making process. At the moment, too much capacity is being assigned to a co-located system, so then it is more costly to reinforce the grid. In reality, it will never use that capacity, so you can be more realistic in the decision-making on what capacity is required.

These actions are being taken at the moment, and a wider reform programme is under way as well. It is fair to say that things are happening, but I am sure that there are areas where public policy could contribute to support Ofgem, National Grid and the networks to do things more effectively.

Q22 **Anna McMorrin:** We know that the national grid is a pretty broken system—an outdated system—in not reaching everywhere, and it is difficult to put right. Where do you even start as Government? What would you recommend? To have those short-term measures, but to make sure you are putting in place the longer-term measures, so that, as you build that capacity in, it will not keep breaking down and causing issues?

Professor Buckley: My take on it is that, at the moment, the decision making for applying for a new connection is a very reactive process. As a developer, you ask to have a connection, then you wait a little bit or maybe a little bit longer, then you get some feedback and then you have to revise the plan. It might make sense to have regional targets for connections so that there is more transparency in where the investments could be made or should be made. That would also help to incentivise the network operators to be more effective in that decision making. I am definitely an advocate of regional targets.

Q23 **Anna McMorrin:** In meeting that 70 GW target, is that your solution to getting to that point?

Professor Buckley: I think that it would help to have a regional breakdown of that target. At the moment there are some scenarios around regional deployment, but they are certainly not communicated as targets for DNOs to look at and act on.

Chris Hewett: There are other long-term things or medium-term things that could be done as well as all those activities, which I agree are very helpful.



Ultimately, Ofgem regulates the amount that is invested into the grid. Again, this is a system that goes back to when we had a load of fossil fuel power stations and nuclear power stations. You turned the dial up and down when you needed to vary things, rather than having a much more variable system that is much more distributed. Bearing that in mind, when renewables were more expensive than gas, it made absolute sense for Ofgem to be bearing down on the costs of investment in the grid because that would reduce consumers' bills. This was before the energy price crisis and so on.

We know now that renewables are cheaper than gas, so it has flipped on its head. Now it is in the interests of the consumer, business and the taxpayer—because we are subsidising energy bills at the moment—that we invest in the grid to get renewables on to the system as soon as we possibly can, because that is the cheapest power. That will bring everyone's bills down. That is not in Ofgem's gift to do at the moment. Its rules are written for the world of 10 and five years ago. Those rules do need to be changed, and the Government can change that with a policy statement. It can change it by changing the duties of Ofgem to make sure—

Q24 Anna McMorris: That takes investment in the grid, doesn't it, and that is a financial investment in the grid?

Chris Hewett: Yes, that will allow Ofgem to change the way it assesses the investment from the DNOs and the National Grid so that more money can be invested sooner.

In the short term, there is one other thing that I think should be considered by Government, and that is that this is now critical infrastructure. It is like the transport sector. It is really starting to slow down economic growth. There is a case for the UK Infrastructure Bank to say, "We will put some of this money in from the public sector—on the public sector balance sheet—to invest in this now," because the Ofgem rules have been set between now and 2028. I think that that is another short-term measure that could be taken in the next few months. Obviously, the money takes a while to flow through, but that is one other area that Government could take a short-term—

Q25 Anna McMorris: In your opinion, who should pay for the upgrades to the grid?

Chris Hewett: In the long term it is coming off consumers—it gets passed through to the consumer—but, as I said, it is a very small slice of the consumer bill that goes on to the networks; the much larger chunk is what we are paying for generation costs. The fact that we are now keeping more expensive generation on the grid for artificially long times is keeping everyone's bills up, so the faster we get that investment in the grid, the faster we get the cheap power on to the system and drive out gas. That is largely what is driving the price.



HOUSE OF COMMONS

Anna McMorris: That goes back to your electricity generation levy point at the beginning.

Chris Hewett: Yes.

Q26 **Chair:** I am sorry to interrupt you, Anna. Can I come in quickly on that? While I hear what you say, there is also the issue that renewables, including solar of course, are intermittent, so there has to be a baseload capacity being provided to the grid. At the moment, that is not being paid for by solar customers; it is being paid for by general customers. If there is no baseload generation from fossil fuels—from gas, for example—how are we going to fund the baseload required?

Chris Hewett: In terms of the concept of baseload power—again, that is something that is of the days when you turned the taps on and off and stopped shovelling the coal or not—as we go forward and the system changes to something that is much more flexible and much more reliant on variable flows in harvesting energy from wind and solar, energy storage will be an absolutely massive part of this as well, and hydrogen, too. That is the world we are moving to, and that is what I hope the REMA reforms will start to address. They will start to say, “Okay, we know what technologies are going to be deployed now, so let’s design the system for those future technologies”—or the present and future technologies—“and not for the ones that are now being retired”.

Chair: Anna, sorry.

Anna McMorris: That is okay, I am finished.

Q27 **Helen Hayes:** I want to ask about the impact of the grid as it is at the moment in terms of the location and feasibility of new solar farms. I understand that sometimes the availability of a connection is a constraint on location. Can you tell us a bit about that and how you think that will affect the future distribution of solar farms across the country?

Chris Hewett: Broadly speaking, the transmission network we have is a sunk cost. It is there; we are not going to start moving or uprooting transmission lines and putting them somewhere else in the country. They are there because of legacy reasons. They are there because there was a coal-fired power station that was located next to a coal-mining area. That is there.

A good example of this is Nottinghamshire, where a number of coal-fired power plants will be retired in the next few years. Something needs to plug into that capacity. It would be inefficient as a country not to use that grid capacity where it is. It happens to be next to a lot of very good flat land, not all of which is particularly good for agricultural purposes, so that is an ideal place to put solar and energy storage. It will also probably create a mini industry of solar and storage, as well as power sector construction because there are a number of projects going in there.



HOUSE OF COMMONS

We need to do this very fast for climate change reasons and for energy security reasons, so we need to deploy solar and wind quickly. We will need to utilise some of those transmission network connections that are becoming vacant because fossil fuel power stations are retiring.

Q28 Helen Hayes: Is additional Government leadership or intervention required to secure the right distribution of solar farms?

Chris Hewett: I think that you go into the REMA reforms and look at how the whole system is designed. I don't think that we necessarily need to be saying, "This is where we want to put solar. This is where we don't want to put solar." That will come from the market. It does not take up that much land. There is plenty of space to put these technologies—I don't know your experience of the grid.

Professor Buckley: Yes, I think that is perfectly correct. We talked about regionalisation of targets, and that is where the existing infrastructure is one of the important factors in figuring out which bits of the country it will happen in. I support what Chris says.

Q29 Helen Hayes: Caroline has questions on domestic solar, but before I pass to her I just want to ask a question based on the experience in my constituency. You mentioned earlier the changes to the feed-in tariff and the impact on uptake from domestic customers for solar installation. The experience in my constituency was that our local high street installer just stopped doing it because the market was not there anymore. I met him, and he had switched to a type of super-insulated window because he was still faced with customers who wanted to make energy-efficiency, eco changes in their homes but there was no market for solar anymore.

Chris Hewett: When was that?

Helen Hayes: He described an absolute drop-off. That would have been 2017 or thereabouts, I think. We are talking about new technology coming on, and you mentioned that you expect there to be an uptick again in the demand. From your perspective, is installation capacity for domestic rooftop solar going to be an issue because of that change?

Ian Rippin: Yes, is the short answer. We are seeing, from the MCS point of view, that the main reason new contractors join the scheme is for solar PV. We are also seeing a lot of heating contractors getting into solar PV. So diversification is happening in the market.

With all sectors—it is common to us too—there is a labour shortage. There is a challenge there for skilled resources. There are lots of initiatives to try to solve that. I think that the scenario you have just described is turning around the other way. We are seeing a lot of small businesses—MCS is made up predominantly of small businesses—looking to solar as a real opportunity for their growth.

Dr Case: The economics have changed dramatically since 2017. The price of modules has dropped dramatically, and what was £3 to £5 per



HOUSE OF COMMONS

watt of installed capacity is as little as £1 in some circumstances, so that makes a big change. Now what is constraining people is getting the product, and that, of course, goes back to the supply chain issues and the China syndrome.

Chair: We will come on to that. We have a very quick point from James Gray.

Q30 **James Gray:** Before we go on to domestic, I want to come back to proximity and all that, and I have two questions. First, given that the solar installation has to be close to access to the grid, does that not produce unreasonable clusters in certain parts of the country—my constituency, in particular, but others too? Do you see what I mean? Is there not a risk that you will end up with a very large quantity of solar in one particular place simply because of that question of access to the grid?

Question two, which you could perhaps answer alongside that, is this. You gave a figure of 0.3%, I think it was, of land being used for solar to achieve the target. That is 0.3% of all land in the UK. What is the equivalent figure for agricultural land?

Dr Case: 0.5%.

Chris Hewett: Off the top of my head, I would have to get back to you on that one.

James Gray: I am amazed it is so little. Are you sure it is—

Chris Hewett: Someone behind me might work that out and tell me later.

Q31 **James Gray:** All right. What about this risk that certain parts of the country will become absolutely covered in solar farms because they are close to access to the grid, while other parts, because of lack of access, will not be? The highlands of Scotland will get none—or not none, but a very small amount—whereas the south of England, for example, will get a very large amount.

Chris Hewett: It is still a small amount of land in total, and that clustering is limited, but you are right, there will be some areas that are more attractive for solar. I think that Nottinghamshire/Lincolnshire is definitely one of those areas where we are seeing large amounts. You are in Wiltshire, aren't you?

James Gray: Yes.

Chris Hewett: I don't know about the cluster in your area, but that is what the planning system is for. The planning system is there. There will be debates about the siting of these projects. These projects are very popular. Some 10 GW that has gone through the planning system already—mostly through the local planning system, or nearly all through the local planning system. There is another 8 GW due to be going through. Some of them get unanimously voted, so this is very common—



HOUSE OF COMMONS

Q32 **James Gray:** I do not want to get diverted, but just picking up slightly on the planning system, the reason they go through the planning system is because the local authorities know that if they turn it down the inspector will overturn the decision because of Government renewables targets. The fact that they have gone through the planning system does not indicate that local people approve of them. On the contrary, they don't, but the planning inspector does.

Chris Hewett: Again, the opinion polling that I have seen that Government have done, that we have done and that other organisations have done, has shown that there is very strong support for solar—all renewables, and onshore wind as well—in all parts of the country. Your constituents are 91% in favour of solar, and 91% would like more renewable projects in their area, according to our polling. I am sure there are people who are opposed to it, but it is actually a small minority.

James Gray: I can tell you what my constituents—

Q33 **Chair:** I think that we will get into that perhaps out of the meeting. Thank you very much. I think that the concentration risk is a problem, particularly in Essex at the moment, where I am aware of an application for, I think, 3,500 acres of solar panel clustered around a particular small hamlet on the Cambridge/Essex border. I think that there are some challenges there, and I am sure that, in that area, you would not quite get the 90% support.

I should have declared at the beginning of this session that I have a farming business that has solar panels on roofs of farm sheds, and we benefit from feed-in tariffs because they were introduced in 2011 and 2015. I apologise for not doing that at the outset. Caroline Lucas.

Caroline Lucas: Does that mean I need to declare my solar panels on my home?

Chair: If you have some, it would probably be—you have just done so.

Caroline Lucas: Okay, good.

Chris Hewett: We are very grateful to both of you.

Ian Rippin: MCS-approved, I'm sure.

Q34 **Caroline Lucas:** Definitely. In fact, I wanted to come to you, Ian. The smart export scheme, as you know, is currently the only Government support scheme to incentivise small-scale solar installations. Do you think that that scheme alone will be sufficient to encourage installation at the rates we have been talking about for this 70 GW by 2035? How could that smart export scheme be improved?

Ian Rippin: I don't think it is sufficient. It has been overtaken now by the economics of cheaper solar panel installations and the return that you will get with a higher electricity price on self-consumption. Interestingly, we hear anecdotally from installers that around 8% of their installations



HOUSE OF COMMONS

now are coming with a battery as well, so that self-consumption argument is growing. I want to use more of the solar that is generated at midday when I am at home at night.

The smart export guarantee, of course, is structured around requiring an energy provider to provide a guarantee, an export tariff, but as long as that is above zero. There is a fairness issue here in how they are buying energy. While it is difficult for an energy company to have a relationship with every single consumer—the role of aggregators will grow over the next five or 10 years—the sense of fairness, in that I am making a contribution to the energy of my local community, is more where we will get people's hearts and minds. The smart export guarantee is not a reason today, frankly, that people are taking on—

Q35 Caroline Lucas: If electricity prices, energy prices, go down—I appreciate that that is not terribly likely in the short term, but if they were to—will the economic incentive still be there sufficiently to drive this target without some other kind of incentive scheme?

Ian Rippin: I think that we will need something else, definitely. The feed-in tariff certainly stimulated the market. It was a very effective mechanism for driving solar PV, and it drove down the cost quite significantly. Quite what that would be, I am not sure, but right now there is a problem over fairness: the energy companies are buying this energy from domestic generators—your home as a power station—and you are not getting a fair return.

Chris Hewett: On the fairness point, there is a place where Government intervention would be helpful, which is those individuals on a lower income who do not have the access to capital. The ability to access cheap capital or free capital is something that the English Government could do. Scotland offers zero interest loans for solar PV, thermal, heat pumps, insulation—a whole range of measures. It would be good to see the English Government do that. The economics will drive it for quite a long time. As we see, electricity consumption will increase. If you are looking to electrify your heat, if you are looking at an EV, those able-to-pay markets will still be incentivised to have on-site generation alongside those things.

The other area that I want to praise a bit is the green homes grant. The green homes grant local authority delivery section was extremely good, extremely effective and drove a lot of improvements to social housing in energy efficiency, solar PV, solar thermal, heat pumps and so on. It would be good to see that extended, because that is a sector of the market that is not going to be buying solar panels, because they cannot afford it.

Q36 Caroline Lucas: That is a good point. Thank you. Keeping on the issue of the capital costs of solar panel installation, finance solutions like property-linked finance or green mortgages have been identified as a tool to help consumers with the capital costs of installation. What do you think



are the barriers to finance for providers who might otherwise offer more of these products?

Chris Hewett: It feels like something that the market should be delivering. Again, maybe we can do something in the regulation to incentivise low interest rates for green mortgages. That could be looked at. I know that a number of building societies and banks are looking to build a green mortgage market, and I would hope to see the market deliver that primarily. Where the Government need to intervene is for that not-able-to-pay market—those who do not have access to capital and will not be taking on the interest-paid mortgages.

Dr Case: We could encourage larger installations, especially in a residential area. You heard the figure that 8% have storage. That is too small. You want a much larger capacity in storage, even in the residential, to make the self-generators and to relieve some of the issues on the grid.

Of course, it becomes a capital constraint issue. In the US, for example, 50% of the installations in California include storage, so 8% means this is below the standard in other parts of the world. Anything that could encourage requiring larger arrays and more storage in the residential and commercial sectors will help everybody, as long as you can come up with a solution on how to pay for it. The economics work over the long term, but it represents the same problem as buying a home. Most people do not write a cheque.

Q37 **Caroline Lucas:** Isn't there a bit of a perverse situation with VAT rebates at the moment? As I understand it, you can get a lower rate of VAT if you are having the battery storage installed at the same time as your solar panels, but if you are doing it retrospectively, you are still looking at 20%, which seems to be quite perverse.

Dr Case: It is a perverse thing. In fact, maybe we should have no VAT on these installations, and solve the problem that way.

Ian Rippin: It certainly was a welcome announcement from the Chancellor's statement in 2022 to have zero VAT on the technology but, as you say, when retrofitting a battery, which is what we want consumers to do, you pay full VAT.

Chris Hewett: We have done research on residential batteries that demonstrates that there is a system-wide benefit to them as well. We modelled that if you had, say, 4 million batteries in homes, you would be using that battery to use surplus wind in the winter.

To answer your question about how solar contributes to heat in the winter, solar obviously has a small contribution to heat, but other renewables do contribute. With electrified heat, with batteries, you will be using the surplus wind in the winter to deliver heat. We worked out that you would basically remove the entire winter peak by having 4 million batteries in homes.



HOUSE OF COMMONS

Dr Case: You double down and encourage the conversion to EVs. When people find out they are paying 50 p or more per kilowatt hour at charging stations, they are not so excited about the EVs that they just bought. When they pay zero off their self-generated electricity, that is another way to push the world forward.

Q38 **Caroline Lucas:** That is a very good point. We have talked about a number of barriers. Are there any legislative barriers, like consumer protection laws, that inhibit finance products for solar energy that you are aware of? Is that an issue?

Chris Hewett: No, not that I am aware of.

Q39 **Chair:** I had evidence from a company that says that the Consumer Credit Act acts as an inhibitor. There is not much of a second-hand market for solar panels because much of the cost of installation goes on the labour to install and the structure that you have to put them in. Therefore, the Consumer Credit Act inhibits the ability to lend against the product because it is not resalable. Have you come across that? It might be more in Ian's area than anybody else's.

Ian Rippin: Not particularly, but I think that could be a symptom of the cost of the modules and the inverters as a proportion of the total cost you pay for your solar PV installation has reduced significantly since 2010.

Chris Hewett: The other point to make about second-hand value is that we did research a few years ago before the energy price crisis, comparing the 10 years of MCS-accredited solar installations and the 10 years of that housing market—this was using the University of Cambridge's Department of Land Economy. The value of a home that had solar on it was £2,000 more than if it didn't have solar on it. That was before the energy price crisis, so I can only think that the value of a solar home has gone up in the last few years and will probably continue to do so.

Q40 **Barry Gardiner:** But it was also when you were getting the benefit of the feed-in tariff.

Chris Hewett: True, yes. That is true. That has to be factored in.

Barry Gardiner: You were getting money back, as it were.

Dr Case: Right, but those home valuations in other parts of the world have gone up with the installation of solar, so it is an attractive asset on the home. Therefore, why should it be treated differently, from a consumer credit standpoint? Yes, the UK is very sensitive about the appearance of roofs and homes and thatched structures, but ultimately it should enhance the value and be addressed that way.

Barry Gardiner: It did my last home. I am with you, but I just wanted to be absolutely strictly accurate.

Chris Hewett: Yes, that is a fair challenge.



Chair: Before we get into completely discursive discussion, Caroline needs to conclude.

Q41 **Caroline Lucas:** I do, and I have two small questions. The first was around the opportunities that the future homes standard offers for further incentivising domestic solar installations. Ian, do you have any reflections on that?

Ian Rippin: Yes. Having solar PV as a mainstay within the future homes standard will be critical. The target, of course, is to have homes that have 80% less carbon emissions than under the old regulations. In terms of solar PV, having not just the minimum required under building regulations, but what's required under the future homes standard, so in-roof solar—why not use the roof for solar?— I think is critical. The problem right now, before the future homes standard, is that it is, in pockets, depending on local building regulations. There is a tendency for installers to just fit the minimum they need. A 4 kW system for a family is not going to power your home.

Chris Hewett: The installers would love to put the full roof on. It is the house builders that are the problem. As we know, house builders will build to the regulations. The good news is about part L. What we are hearing from our members in conversation with the big home builders is that pretty much every English home from June 2023 will have some solar on. It won't have enough. The key when we move to the 2025 future homes standard is that what we need to see is solar, heat pump or other forms of electric heating, EV charging and maybe a battery. That needs to be the standard for a new home by 2025.

Ian Rippin: That has to happen. I think that is the expectation of young people buying new homes. It would be like having an outside toilet; they won't understand why there is not this amount of solar on the home that they have bought.

Q42 **Caroline Lucas:** I have a very quick last one for Chris Hewett. A report by the UK Warehousing Association found that UK warehousing has the roof space potentially for up to 15 GW of new solar. Do you have any thoughts about what could be done to encourage the warehouse sector in particular to install solar panels on their properties?

Chris Hewett: From my conversations with the UK Warehousing Association, I do not think that it needs any encouragement. That is why it produced the report. It absolutely wants solar on their roofs. The barrier goes back to the discussion we had earlier about grid. There are definitely grid constraints around some of those large rooftop installations.

Something that is changing the market is that there are many more, larger roof installations being put in. So 1 MW and 2 MW roofs are very common now in the industry, whereas, in the feed-in tariff days, that did not really happen. That commercial rooftop sector is growing. It is not



HOUSE OF COMMONS

just warehousing; it is food processing, refrigeration, the water sector—a lot of areas are looking at this.

Q43 **Caroline Lucas:** Do you think that expertise and the lack thereof is an issue in people feeling confident enough to know exactly what they are asking for and getting?

Chris Hewett: Yes. You mean within the energy-buying sector itself?

Caroline Lucas: Yes.

Chris Hewett: Yes. We increasingly have conversations with those sectors. We produce guides for corporate buyers—a beginner's guide to how you go about getting solar on your building. There are different ways of doing it. We are working together as a sector to try to drive that. The expertise issue, which is probably the biggest barrier, again goes back to the skills issue around the capacity of the sector to deliver.

Chair: We have a vote coming at 3.30 pm and we have two sets of questions to come. I will move on to Ian Levy and then Jerome Mayhew.

Q44 **Ian Levy:** I would like to declare to the Committee that in my constituency of Blyth Valley we have a solar panel manufacturing company, which I had the pleasure of going around in the autumn of last year, and I was absolutely astounded. It does the R&D and the manufacture of the solar panels, and all the different things that they can be used for I found very interesting.

I would like to talk a little about green jobs and how that works. With the expansion of solar technology in the UK, we will require a larger workforce. Where are the largest skill gaps currently? I will put two questions into one. What are the opportunities within those skill gaps? We are pressed for time, so I will try to squeeze that in. I will start with Professor Buckley.

Professor Buckley: The opportunities for skill gaps? I want to defer to Ian. I know that Ian wants to speak.

Ian Levy: That is absolutely fine. I was just going to start at one end and work my way along.

Ian Rippin: It really is a fantastic opportunity. We are hearing from our installers that the issue is finding people. There are all sorts of initiatives now coming to the fore, not least something that we are working on with our colleagues at Solar Energy UK and Solar Skills London to create a pipeline of new recruits that installers within the capital can recruit from. The new domestic electrician apprenticeship that is coming out includes solar as standard. An electrician should understand how to fit solar. They might need a scaffolder to help them.

There is a great deal we could do to more engage young people in what the opportunity is. We took a group of students from the City of Liverpool College to Solar & Storage Live, the trade show, and I was quite shocked



HOUSE OF COMMONS

at how many of them did not understand the opportunity in solar, yet three quarters of them, after they had spent time with us, wanted to—

Ian Levy: Were they students from school?

Ian Rippin: They were college students doing apprenticeships in either electrical or plumbing and heating. They were turned on—no pun intended—by the opportunity. When you look at the jobs from a levelling-up point of view, a solar installer in London and a solar installer in Liverpool earn about the same. It is a really attractive career. It is the youth who are most interested in green technology and doing their bit for climate change. I am enthused by the opportunity, but right now there are challenges across most sectors.

Chris Hewett: I think that high-voltage skills is one that is definitely missing, not just in our sector but in other bits of the electricity sector. The grid issues are also the problem with some of the skills in the market. That is there.

I agree with Ian that there is a massive opportunity. There is now a certainty that there is a career in the renewables sector. This is not boom and bust anymore. This will grow. If you want to stay in that sector for life, you can do. You are starting to see people come from other parts of the power sector into renewables, but it is that next generation that will be the key.

Ian Rippin: It is becoming aspirational.

Dr Case: I will make the first comment from the science side. We do not have any skills gap. We are leaders in science, including in terms of leadership in this solar field, with the technology we have described here. Before you address the skills gap, address the manufacturing gap. With the exception of the plant that you are familiar with, there is virtually no manufacturing of solar panels or solar cells in the UK. Although the Europeans also do not have that much, their plans to grow are tremendous. Of course, we are facing the challenge of manufacturing coming out of China—

Chair: We are coming right on to that in the next set of questions.

Q45 **Ian Levy:** Professor Buckley, did you want to come in?

Professor Buckley: I support all these things. One aspect that we have not spoken about yet is the data side of things. The renewables-led energy system requires a lot more data-type roles to understand the system, manage the system and make decisions about the system. There is a focus on pulling new graduates through into database roles within the sector.

Ian Rippin: Systems integrators, yes.

Q46 **Ian Levy:** Ian, if there was one thing that the Government could do to



help, what would it be?

Ian Rippin: I think that there is more we could do to promote the opportunity to young people. The apprenticeship levy, of course, is underspent. There are new apprenticeships—not least the one that MCS is developing for low carbon heating technicians, which we are hoping to launch very soon. There is a great deal of demand for it. Colleges will need support to deliver the training, because teachers do not necessarily have the skills. I think that is promoting this as a real career opportunity.

Ian Levy: More within schools?

Ian Rippin: Promoting it in schools and when people are making decisions at GCSE level. We know that is the point where they are talking about this. In terms of the old, “I want to be an electrician,” or, “I want to be a heating engineer,” those things are 10 years ago. Now people are thinking, “I want to fit solar and to provide systems for people’s homes.”

Ian Levy: Thank you. I appreciate your time.

Q47 **Jerome Mayhew:** I only have five or six minutes, so I am going to have to rattle through. I will focus on Dr Case substantially. You gave us the little promo on your product at the beginning.

Dr Case: Sorry.

Jerome Mayhew: No, it is great.

Dr Case: I might have missed it with five minutes to go.

Jerome Mayhew: I just want to clarify something. You said that standard PV is about 25% efficient. You then said your product would increase it by 40% or to 40%?

Dr Case: It is always good to have a little clarification. The solar cell—this piece that is the heart of the solar panel—is the thing that might be 25%. When you make the panel, the efficiency is a few per cent less. The panel itself might be only 23% conversion efficiency. The addition of this material I talked about is like putting a second solar cell on top of it. Effectively, they are two solar cells in series. That raises the efficiency by at least 20%. That is 20% today. Our road map takes—

Jerome Mayhew: I come back to the same clarification: 20% on 25% takes you to 30%, doesn’t it?

Dr Case: Yes, 20% on 25%. Our solar cells would be 27% or 28% efficient, compared to 25%.

Q48 **Jerome Mayhew:** That is the clarification, very good. It is still a very significant improvement. When are you going to be in a position to manufacture at scale?



HOUSE OF COMMONS

Dr Case: We have a manufacturing plant in Germany today that we acquired five or six years ago, and we are about a year or so behind our manufacturing ramp for probably the reasons you would expect—covid, delays in the supply chain and so on. We will have product available to customers to turn into panels by the end of this year with this technology.

Jerome Mayhew: But produced in Germany?

Dr Case: Produced in Germany as solar cells, because that is what we make, and turned into panels also somewhere in Europe.

Q49 **Jerome Mayhew:** Okay. Jumping forward to the question you yourself posed, why is it that we do not have more manufacturing in the UK in this area, and what are your plans to manufacture in the United Kingdom?

Dr Case: Our plans are to grow our company as much as possible, and all solar requires economies of scale to be effective. That is what the Chinese have done. They make huge plants—20 GW size plants. Our plant is much smaller than that. We want to build multi-gigawatt plants, so we have been looking for the next home. We are looking everywhere it makes sense to. We have not made a final decision on where to locate, but I will tell you that when we went to Germany five years ago it was because of incentives that were provided. We got 20% subsidies on the production of our factory. Incentives do play a role.

Q50 **Jerome Mayhew:** Professor Buckley, moving away from one company's innovation and looking at the wider sense of innovation in the industry, can you paint a picture of how much is out there and how excited we should be? It is sometimes described as a mature technology, but it feels like there is some movement as well.

Professor Buckley: I guess it is a mature technology, but it is still innovating all the time. Every year there are improvements in the devices that are coming out. To start with, those improvements were largely reductions in manufacturing costs per square metre or per module, but about three or four years ago the manufacturing costs per module started to level off. Since then it has all been about efficiency improvement. Oxford PV's technology will provide an efficiency improvement.

There are a whole range of different approaches to improving efficiency, and all of the big solar cell and solar module manufacturers are pursuing a huge amount of investment to improve efficiency, because it means their products are competitive.

Chris Hewett: I just want to add to the excitement. As well as all of that there are other new materials. There is thin film—there is the firm you mentioned in Blyth and another company doing thin film as well—which will basically be able to go on a roof, but it is much lighter, so that changes the way you can apply it. This is not in the UK, but there are at least two companies I know that have integrated solar into an electric vehicle, so it is charging as you drive and as you park it in the street.



We have mentioned floating cell, and that is very likely to happen in inland waters. Watch out for offshore. There are definitely people who are looking at putting solar offshore. Again, with offshore wind, could we marry those two things up? There are all sorts of different things. There is a technology company doing PVT, which is photovoltaics and thermal in one technology. That is a UK-based company. Alastair is right, there are a lot of new innovations to come.

Q51 Jerome Mayhew: I am going to cut you off because we are running out of time. I will take it as read, because of your previous answers, that Government intervention to increase R&D probably isn't the area we should be focusing on. We are world leaders in R&D, but the weight of your evidence is pointing in the direction of manufacturing and encouraging manufacturing. You are all nodding. Great, so I will skip on from that.

On supply, Dr Case has raised the issue of the geopolitics and the dominance of China. Am I right in thinking that they control about 80% of the supply of the current photovoltaics? Can you expand on how we can become less reliant and perhaps do more than just build more here, which would be a simple answer in terms of the manufacture? What more can we do in terms of the control of access to the minerals and the raw materials that go into these things? Who feels that they are competent to answer that question?

Dr Case: The supply of the material, which is the silicon that goes into the common panels that you see, comes predominantly from south-east Asia—from Asia and from China. Some of that is conflicted with this forced labour issue. About 40% of the world's production is probably subject to these concerns about forced labour, so you must solve that problem.

Chair: In Xinjiang?

Dr Case: Xinjiang, absolutely. But it does not mean all the world's production has that issue. There is supply that you can make sure is free of those kinds of forced labour issues, and that is critical. The standards for sourcing materials in that fashion are mandated in Europe. Ultimately, can you get enough material to supply the rest of the world from outside of China? Yes, but it will take some time to build up that infrastructure.

For the material that we are developing—this perovskite—we have studied it carefully to make sure it can be sourced and supplied outside of regions of conflict and at low cost to the capacity of 30 TW. It is not a material that would be a problem if we pushed forward with deploying this technology in the future.

Q52 Jerome Mayhew: I am going to cut you short. The USA have brought in the Uyghur Forced Labour Prevention Act; we do not have anything like that. Do we need it?



Chris Hewett: I can take that. As an industry we have been aware of these concerns for 18 months. We have been working in partnership with Solar Power Europe, which is the solar power body for the rest of Europe, to develop a solar stewardship initiative, which is a draft code of conduct. It is already being piloted. The aim of that is to increase transparency of the supply chain to enable us to have a better understanding of what the conditions are.

The highest risk from the forced labour issues is right at the top. It is the extraction and the initial refining of the mineral, which is not unique to silicon; it happens in many mineral industries. We will have a standard or initiative in place, which will be like the responsible steel initiative or the aluminium stewardship initiative. We are hopefully ahead of that curve, and we are trying to improve that transparency. We would like to see other energy sectors follow that transparency.

I do not know whether the fossil fuel—the oil and gas—extraction has the same levels of transparency that we are developing in the solar industry, because these problems are not unique.

Q53 **Jerome Mayhew:** Just while we wait for the bell, I would like to double back, if we can, Dr Case. This is the manufacturing base I am interested in. Incentives to locate are one thing, but is that literally the only determinant as to why we are not getting a significant amount of growth in this sector in this country, or is it historic reserves of the right kind of businesses that can develop? You have Siemens, for example, in Germany. It is a very natural progression for their business model. Do we lack that?

Dr Case: There is nothing about the UK's competency in manufacturing that would limit our ability to build up manufacturing in PV. It makes no sense to ship 20 kg panels from China when most of the weight is in the glass. The solar cells weigh 500 grams. Build the modules—the panels—locally. We have a glass supplier in the UK, Pilkington, which is a major supplier to the PV industry—not the standard PV, a different kind of material. Build up that local manufacturing capability in silicon. *[Interruption.]*

Chair: I will call us to order because a Division has been called. I conclude this panel. I would like to thank our guests, Ian Rippin, Chris Hewett, Dr Chris Case and Professor Alastair Buckley for joining us.

Examination of witnesses

Witnesses: Dr Alona Armstrong, Judicaelle Hammond and Paul Miner.

Q54 **Chair:** Welcome back to the Environmental Audit Committee for our second panel this afternoon on the important topic of solar energy. We are joined for this panel by, essentially, representatives of the land use community. I will start by declaring that I am a member of the Country Land and Business Association, which is represented here today by



HOUSE OF COMMONS

Judicaelle Hammond. Perhaps you would like to say what you do, Judicaelle.

Judicaelle Hammond: I am the director of policy and advice at the Country Land and Business Association. I look after advice to our 27,000 members across England and Wales. We also work with Government across a number of sectors, including energy. If it happens in the countryside, chances are we do it.

Chair: Thank you. We are also joined by Paul Miner from the CPRE. Welcome.

Paul Miner: Good afternoon, everyone. My name is Paul Miner, I am acting director of campaigns and policy and also head of the policy and planning at CPRE The Countryside Charity. I am also a chartered town planner.

Chair: Thank you. Dr Alona Armstrong from Lancaster University, what do you do there?

Dr Armstrong: I am director of Energy Lancaster, a cross-discipline grouping of energy researchers, and also a senior lecturer in energy and environmental sciences in the Lancaster Environment Centre. For the last 10 years my research has been focused on better understanding the interactions between the renewable energy infrastructure and the hosting ecosystem, with a focus mostly on solar.

Q55 **Chair:** Thank you. I think you were present during our first panel earlier this afternoon. You will have heard the discussion at the very beginning about land use and the scope for solar farms to develop and about whether that would impact on food security.

I will start with you, Judicaelle. Do you see the increasing prevalence of solar farms as having any material impact on our ability to produce food in this country?

Judicaelle Hammond: The short answer to that is no, for the same reason as the members of the first panel gave. It is a very small area of land and even if the Government target for increasing solar energy is to be met, that will still be a very small amount of land. I think one of the previous panellists reckoned it to be 0.5% of land currently used for farming. It is a very small—

Chair: That would be for solar panels on farms?

Judicaelle Hammond: For solar panels on farms, yes. No, is the answer. I do not think it will make a material difference.

Q56 **James Gray:** I will drill down a little bit into the 0.3%, 0.5%. That is very probably true if you include, for example, the highlands of Scotland, where there are tens of thousands of acres of land that could not possibly be used because it is too far away from the grid. I would much rather know what percentage of useful agricultural land down to 3b would be



used to achieve this target.

Judicaelle Hammond: I do not have a figure on that but what is a constraint on where the sites are, and also how many sites you can have, is the availability of grid connection and the proximity of a substation into which to feed. In any case you are constrained by that.

Q57 **James Gray:** That is precisely my point. That invalidates this figure of 0.3% because a very large part of that 0.3%, on balance, could not be used anyhow. Therefore, it would be very interesting to know from CPRE and yourselves how much currently useful agricultural land would be used to achieve the target. I am also very mindful of what you say about proximity to the grid.

What I am getting at, and what the Chair mentioned a moment ago, is this application for 3,500 acres in Cambridgeshire. I have a very large number in Wiltshire. The risk is that there will be a very large cluster of solar farms in suitable areas using up productive land, whereas, you are quite right in saying that north of Inverness there will not be very much.

Judicaelle Hammond: North of Inverness there are not that many people needing that electricity either, I should imagine.

Q58 **James Gray:** That is not the point, unless you are suggesting that we produce electricity in the area where it is being used. Presumably that is how the grid works. It does not matter where the people are. After all we produce all sorts of energy in various places where we do not use it, and it gets transmitted through the grid to the rest of the country.

Judicaelle Hammond: That is certainly one model, but there are also scenarios where you try to produce it closer to where it will be used, and you have local grids or mini grids. That doesn't require the amount of land that we are talking about in the mega schemes.

Q59 **James Gray:** If the people of Wiltshire, for example, have enough electricity from our own already existing solar or renewable, we don't need to do more because Wiltshire has been supplied. Is that right?

Judicaelle Hammond: That is obviously not where I was going, but there are a number of scenarios, I think, in the amount of land that you would need, and the scale of the projects that you need, depending on basically what you want to do with it and whether or not you are looking at resilience of the local grid versus production for the national infrastructure and the decarbonisation of the grid as a whole.

Q60 **James Gray:** Rather than prolong it, what would be useful would be if somebody, one or the other of you, could do the calculation of what percentage of productive agricultural land would need to be used to achieve the Government's target, ignoring land that couldn't be used for solar otherwise.

Chair: Thank you, James. You are coming in with a set of questions on land shortly. Rather than absorb all of my time, I am going to allow Dr



HOUSE OF COMMONS

Alona Armstrong to comment on that and then I am going to ask a few questions.

Dr Armstrong: I do have some numbers. I can tell you how much. We have current solar parks across the UK digitised. This is about a year ago, so it is a little bit out of date, but I can tell you they cover 0.06% of the UK land surface.

James Gray: I am not interested in the land surface, I am interested in the productive land.

Dr Armstrong: It is 0.17% of arable land, 0.06% of improved grassland and 0.02% of semi-natural grassland. When you are talking about the best and most versatile agricultural land, there is an agricultural land classification map, but there is a challenge in using that. It was developed in 1988, and the Government website specifies that this is a map—it is indicative—but you need to do individual site assessments. I have talked to a professor of soil sites in my department, and I don't think we have good enough soils data to do that remotely unless we go into planning apps and see whether they have done—

Q61 **James Gray:** Finally, and this is important, the question is whether food security will be impacted. For us to answer that question clearly, we would need to know how much productive and cultural land that is currently being used for food production would be used for solar in the event that we achieve the target. That is the figure we need, not the percentage.

Chair: Professor Armstrong, are you able to write to us indicate—

Dr Armstrong: Yes. I have the data on a spreadsheet here with the predictions, and there are assumptions, but I can give you an overview, clearly delineating assumptions, if that is helpful.

Q62 **Chair:** You will be able to write to us with the answer to James's question?

Dr Armstrong: Yes.

Chair: That will be out to the 70 GW target?

Dr Armstrong: I can do it the 70 GW target, yes.

Chair: That would be very helpful. If we might be able to compare the position today, which is obviously much less than that, to where the Government want to get to, that would be most helpful.

I am going to allow Paul to come in before I get on to grade 3b land, which I want to come back to.

Paul Miner: As we mentioned in our written evidence, we did a survey of the best and most versatile land earlier this year in a report called "Building on our food security" and we worked with Natural England using



HOUSE OF COMMONS

the mapping they produce. Some of it is in the public domain, and they rely for grade 3b land on predictive mapping, as Alona pointed out.

In that report we found that about 14,000 hectares of best and most versatile land have been built on, or have intended development use, since 2010, and that is about 0.6% of all BMV land. In turn, of that 14,000 hectares, about 1,400 has been developed for solar, so it is about 0.06% of all solar development.

We would question whether there is a need to develop any BMV land at all for solar. We think, given that it is 42% of all farm land in England and that, in turn, farm land in England takes up 70% of England's land area, there are other options to building on best and most versatile. We think more should be done in policy to concentrate on those options. You could build more on brownfield sites and, in particular, car parks and rooftops.

Q63 Chair: Following this thread a little bit, the new Secretary of State, Thérèse Coffey, indicated shortly after she came into post that she felt the definition of best and most versatile land would not be extended to include grade 3b. You have just indicated, Mr Miner, that here are some 14,000 acres of grade 1 to grade 3a land that is currently under solar.

Paul Miner: 1,400 hectares.

Chair: Sorry, 1,400 hectares under solar PV. If, in future, development is on 3b or worse, is there sufficient capacity to achieve the Government targets across England?

Paul Miner: We will publish further research on this in the coming months, but we believe that there is more than sufficient capacity on brownfield sites and rooftops to accommodate that target.

Q64 Chair: Does anybody else have a view on that?

Judicaelle Hammond: According to what we know at the moment, we think that the problem, if we went for brownfield sites and rooftops only, would be, as described by the previous panel, the ability of the grid to take it. If you tried to electrify the roofs of rows and rows of houses, either in the countryside or in towns, is the local grid going to be able to take that? If you add potential for heat pumps and electric vehicle charging, you are increasing the demand. I think we have a problem of constraints anyway, and one of the figures that was given last time was one third at the moment is on roofs and two thirds is on land.

My members would love to be putting more on the roofs of their sheds, barns, offices and, indeed, houses. They find the same constraints with grids. For us it is not either/or; we absolutely need both.

Q65 Chair: At the moment there is a queue to get access to the grid operated by National Grid, which leads to very expensive quotes. That is how they manage the grid, which stops applications, whether they are rooftop or ground mounted. There also will be a demand to more than quintuple the



HOUSE OF COMMONS

amount of electricity generated in the country to cope with the increasing demand as we decarbonise.

These things will have to happen in parallel—increased capacity and increased generation on land. I think the issue for this panel today is whether, if we do it on land, that has other, adverse consequences to achieving other objectives, be it food security or biodiversity, which we ought to take into account when deciding where we will build this capacity.

Q66 Barry Gardiner: It would be helpful if one of you, or all of you, could write to the Committee to break down by percentage and by hectares the land that is 1 to 3a, the agricultural land that is 3b and lower, and land that is non-agricultural land, and then give us the percentages and the hectares that are taken up currently and that will be taken up to meet the 70 GW target that the Government have set. It is rare that James and I find ourselves wanting the same information. We may want it for different reasons on this occasion, but I think it is fair that we should have the data as a Committee to be able to make the judgments that we need to.

Dr Armstrong: I can do that, and I am more than happy to do that. The agricultural land classification layer is not accurate. My other comment is that, generally, we need to be moving away from single-use land. Many solar parks are grazed, and they are co-producing energy and food.

With some colleagues at Imperial and a couple of other universities, we have been starting to look at agrivoltaics for growing crops under solar parks. You might take up more land, but what does that mean for overall land use efficiency and crop success because you are protecting crops from the elements, increasing numbers of storms and so forth? Then, in terms of biodiversity improvement at solar parks, you can have benefits on surrounding land through managing the pollinators because of our pollination deficit. There are these additional benefits that can stack up, but it needs to be considered and done wisely.

The other thing that occurs to me as an academic, which is related but not central perhaps, is that there is a lot of focus on food sovereignty and protecting our food production, but we are in this unprecedented state in terms of energy, so how do we rank food sovereignty with energy? Are we going to import energy or are we going to import food?

Barry Gardiner: Both.

Dr Armstrong: Both, in reality.

Q67 Chair: You have twice referred to the agricultural classification as not being fit for purpose—for this purpose. Can you expand on what you mean by that?

Dr Armstrong: It was developed in 1988, and our datasets—

Chair: There has been an agricultural land classification going back much



longer than that, with different grades of land.

Dr Armstrong: The latest report I saw was that the update was 1988. As far as I am aware, that was the last update. The number of datasets we have has moved on quite considerably since then, and our understanding of soils, their systems, how they work and how they support food production has also changed.

That document also states that it does not take into account the impacts of weather or land management. We are operating under changing climates. Farms and solar farms can also be managed well or managed less well. It is at a national level and is based on data, but there can be finer-scale variations than the resolution of the map. That is why the Government website recommends individual site surveys.

Q68 **Chair:** Perhaps I can give you an example, just to push back to you on this. In my constituency we have recently had four applications for solar farms approximate to the town of Ludlow, one of which was rejected on planning by Shropshire Council precisely because the proportion of the ground that was grade 3a compared to grade 3b within the site—you can get down to that granularity at the planning level—was excessive. They felt that was inappropriate. Other sites went through, and they specifically excluded placing solar panels on the 3a grade within the site. The evidence that I have is that it is being used precisely by planners to determine where solar panels could go. Judicaelle is nodding. Is that your experience?

Judicaelle Hammond: Yes, absolutely, as it should be. There is very clear guidance within the planning system that says that best and most versatile land should be avoided wherever possible.

Paul Miner: We still believe that there is an important role in the system for the best and most versatile land system, but we agree with the points that Alona makes that there are a number of respects where it needs updating. The land classification data goes back further, to the 1940s, I think. It was most recently updated in 1988.

Part of the problem with the current data on best and most versatile land is that the mapping does not differentiate between grade 3a and 3b. Therefore, when there are planning applications that might affect development on 3a land, site-specific surveys then need to be done to determine the land—

Chair: I am going to come back to agrivoltaics in a minute but—

Barry Gardiner: I do not think, Chair, that you and Dr Armstrong were disagreeing. It is the case that if we want the data that we have asked for, we have to take account of the fact that we need exactly what you said, which is that specificity when it comes down to the local level. That is the difficulty with knowing what percentage is in which category at a national level.



Dr Armstrong: The map might say it is grade 3b, and it might be grade 3a when you get to the field, because of the resolution of the mapping. That is all.

Q69 **Chair:** Thank you for that clarification. You touched on the fact that there needs to be more recognition that agrivoltaics is possible. To what extent is it realistic across the universe of solar farms for agriculture to take place in combination with solar panels? Are there examples that you can give where this is being done effectively at the moment? Do you think it should be a requirement, subject to the quality of the land that is being covered?

Dr Armstrong: A lot of them are grazed in the UK. Solar Energy once said about 50%, but I may not be getting that figure right. I am not aware of any crop systems in the UK yet, but I know that Solar Power Europe have a workstream on agri-PV because it has been done so extensively in Europe. There are research facilities in several countries—Germany for one. It is being adopted across the world. It is most common in areas where there is higher solar radiation. We are pretty light-limited in the UK, and that is a challenge, but we are also doing vertical farming in the UK, where we supplement with LED lighting. The technologies are there, but I think we need to look at whether the costs and the benefits stack up for the UK.

Judicaelle Hammond: I have heard of soft fruit growers trialling what I would describe as panels on stilts. Instead of the normal ones that you are probably used to seeing, which are fixed and on an incline, those act almost as a fence. You can graze quite large cattle under them but you could also have some crops. What I don't know is how efficient they are compared to the typical models that we are used to seeing. The other potential use was for biodiversity and a different kind of habitat underneath as well. I am sure we will come to that.

Q70 **James Gray:** Briefly on this question of alternative uses, evidence I have heard from all worth-while, serious sheep producers is that the quality of land, the quality of grass, is such that they would not even possibly contemplate grazing their sheep under solar panels. It would be interesting to know if you could produce some evidence for the Committee of productivity of sheep farming—I want some evidence. People will say you can use a sheep farm. I have never seen it. We have a lot of solar farms, we have a lot of sheep, and the two never mix. Incidentally, where one farmer tried it, they damaged the panels. I would like to see some real evidence on sheep. With arable, maybe you could grow something under them but how would you harvest it?

Judicaelle Hammond: I was sent a picture by one of my members of two rows of solar panels spaced exactly so that a combine harvester could fit between them, and it was a field of wheat. It can be done.

Q71 **James Gray:** Grow wheat under a solar panel?

Judicaelle Hammond: It is not under; it is between.



James Gray: Could we please see that? I find that extremely difficult to understand. I find it an astonishing notion.

Chair: I went to a presentation recently from, admittedly, a start-up company that is yet to do it, which is looking at different types of agriculture—soft fruit farming, as you have mentioned—between rows of solar panels. Like you, I am very sceptical as to whether that would apply for major equipment used to harvest, because the risk of damaging the panels is very high. I suspect that the cost of installations elevated may at this point be somewhat prohibitive.

James Gray: We are moving to driverless tractors; that is the future. All combine harvesting is now being done with driverless combines. I am not going to put my £1 million-worth of driverless tractor into a solar farm, thank you very much indeed.

Chair: We will move on now to Matthew Offord and some questions about biodiversity.

Q72 **Dr Offord:** I think James's experience of tractor driving might be along the lines of Jeremy Clarkson's school of farming.

I want to ask about the ecological consequences of solar farms. Our discussions have indicated that there could be both benefits and drawbacks. I want to ask Dr Armstrong about research in this area—I studied at Lancaster for my MA in Environment, Culture and Society with Bronislaw Szerszynski, so I have picked on you for this question. Are there any gaps in the research around this area? What are the benefits and drawbacks of solar farms ecologically?

Dr Armstrong: There are certainly gaps, for sure. I started this work in 2015, and a couple of years ago a US colleague said, "I think you are the only person in the UK/Europe doing this sort of work," so there are significant gaps. There are more people beginning to look at it now, with floating solar, which we do some work on, as well as ground-mount systems, so that knowledge is coming through.

One of the challenges to that knowledge is the research funding landscape—the Natural Environment Research Council looks at fundamental research, and that is one of the things that has been stopping it. We have some big datasets coming through now. We have data from 35 sites looking at natural capital and ecosystem indicators, data from 10 sites looking at soil health and data from 15 sites with measured pollinator surveys, linked to floral resource, vegetation surveys and so on. Unfortunately the natural capital, ecosystem services and soil health data was collected last year. It is a lot of lab work, and the datasets are only just being analysed, so I cannot give you any hard answers today, which is frustrating, but in the next few months that work will be coming through.

In some of the earlier work we have done, we produced the SPIES tool—the Solar Park Impacts on Ecosystem Services tool—which is currently used by industry, and we have seen the output of it put in the planning



system as a technical appendix. That uses robust scientific evidence, looking at land management impacts—grazing regimes, mowing and installing habitats—on ecosystem services, but not very much of that was from solar parks, because there was not any literature on it. Then we used that to produce a tool that essentially filters the evidence. It says management actions that are suitable for solar parks and how that impacts ecosystem services there, to help inform the industry on how they could avoid detrimental impacts and promote positive impacts.

We also have—again, generated by systematic review—10 recommendations for managing solar parks for pollinators, including on ensuring that they have floral resource through the year, the structure of vegetation and habitats, and so on. We have done what we can with the robust scientific evidence there is, and then we are pushing forward with the field assessments and measuring what there is.

The other aspect of it is that I did take some measurements of soil properties and vegetation, and I did some greenhouse gas emission work, at a site—Westmill in Oxfordshire—back in 2015 or so, but the challenge there was that that site had only been installed for two years, so you are still having this transition effect. In terms of soil health and soil carbon, you will be lucky to see a change in total soil carbon in five years, so it is a slow response. That brings challenges, but we do the best we can with modelling approaches to try to fill those gaps and give as much useful information as possible. That is robust enough to help guide management and practice.

Q73 Dr Offord: What about species biodiversity? For example, certain species of birds might find it difficult to breed or to exist in light of the location of some solar farms. Is there adequate planning guidance and planning policy that protects those kind of species?

Dr Armstrong: As far as I am aware—I am beginning some work with a colleague who is a bird specialist—there has been a little bit of work on solar parks and birds, but not that much. There are some species of concern, like skylarks, which some ecological consultancies have written a piece about for a practitioner magazine on what may be happening there, but we are beginning to produce data from that. What I know from the land use change for wind farms—I am sure you are aware that there was a lot of talk about birds and bats and wind farms—is that a synthesis paper was done that showed that the worst impacts were during construction because of the disturbance. After construction some species came back, some didn't and some new species arrived. Is it about the total diversity? Is it about particular species of interest?

Q74 Dr Offord: Expanding on the issue of biodiversity, what if the land is used for grazing? Would that have an impact particularly upon biodiversity?

Dr Armstrong: It depends how it is grazed.



Dr Offord: Let's take the example of sheep.

Dr Armstrong: It is the timing of grazing as well. If you want to graze them later because you want to give wildflowers the chance to seed, you don't want to have grazing densities too high.

The other thing is that they are sites generating energy. People are quite confident that the margin areas around the fencing are managed very well for biodiversity. But they are keener to keep the rows between the panels, where they might need access for maintenance or to stop panel shading, shorter and more accessible. Some people do strip grazing instead of grazing the whole gap between the panel. Obviously, depending on the distance, they will just mow a metre and a half in front to stop the shading, but let the rest of the vegetation grow.

Q75 **Dr Offord:** Just like wind turbines, solar farms are temporary—they can be removed and, most likely, they will be at the end of their working life. When that happens, do you see a change in the biodiversity? Does it fall or does it continue to evolve from what has been achieved in the period when the solar farm was established?

Dr Armstrong: I am not aware of any sites that have been depowered, but if it is turned back into an arable field, I would take the guess that biodiversity may well decline, but again it depends on how that field is managed. It is not just about land use; it is what this land is managed for. Management is very important. You can manage a farm very well and try to sequester carbon and improve biodiversity, the same as a solar farm, or you can do it less well and not have those co-benefits. It is about encouraging the industry and the landowners to do things as well as they can to boost biodiversity.

We have been doing some work with Solar Energy UK to provide a standard biodiversity monitoring protocol. Some companies are really into biodiversity and are dedicated to it; there are some that, with a bit of a nudge, might do more. It is about managing as well as you can. It is not just about what you are using the land for, if that makes sense.

Judicaelle Hammond: It may well be that, at the point where a solar farm gets decommissioned, in many, many years, the biodiversity underneath is so flourishing that you decide you are going to maximise it. You will be going into a Government scheme, assuming that they are still on at that point, a private scheme or a biodiversity net gain scheme. As Alona was saying, there are plenty of opportunities to build on whatever biodiversity you have managed to bring in that field.

Paul Miner: One point I will add at the end is that it is also important that you have local authorities that are sufficiently well empowered and well resourced to be able to monitor what is happening and also to follow up on the implementation of these conditions. It is a separate policy debate in one way, but it did give us great cause for concern that the Government have rowed back from the local nature recovery part of



environmental land management, because that would have helped empower local authorities a lot more. That should be returned to in future, and it should be seen in the round of this as well.

Dr Offord: Thank you, that is very helpful.

Q76 **Chair:** A former president of the CLA, Lord Cameron of Dillington, told me that he installed a solar panel farm on a piece of land in Cornwall 20 years ago and that the Cornish Wildlife Trust has claimed to him that it has the best biodiversity of any site in Cornwall. Can you verify that for me? Do you have any evidence from your other members that this is what happens to long-standing solar farms?

Barry Gardiner: Or would you like call his lordship a liar?

Dr Armstrong: Can we go and measure it?

Judicaelle Hammond: Exactly. That is a good case study for you.

Chair: I am serious. Is there any evidence that it is beneficial to biodiversity? Maybe the CPRE has some evidence on that.

Dr Armstrong: I will just flick to a PowerPoint. We have some evidence that compares biodiversity at solar parks. We compare it to countryside survey data that is collected by UKCEH and compare it to arable land, improved grassland and semi-natural grassland. We have done that with species numbers and we have also done it for soil properties. That is why comparing it to arable land, which obviously has crops on it, was part of the design. For some things solar parks are better, for some things they are less good and for some things there is no difference.

In terms of the challenge of interpreting that, and I fear I am sounding like an academic, this is never simple, because solar parks were put somewhere for a reason. For some elements, such as, I think, soil carbon—if you are interested, I can send you information in case I have this wrong—it was perhaps lower. But was the reason that those solar parks had been put there that the soil was deemed less good by the farmer? Soil health and productivity are linked to soil carbon, so—

Q77 **Chair:** But in the era of biodiversity net gain, which the Government are promoting, if biodiversity improves on ground that is not disturbed for 20 or 30 years, which seems intuitively likely, there is the potential for a significant additional reason to be doing this, for it to be consented to by local authorities and for farmers to undertake it. Is that a fair proposition?

Dr Armstrong: That is a fair proposition. Obviously there is the caveat that if you convert a low-grade, degraded arable field into a solar farm and manage it well for biodiversity, there are probably net wins ecologically. If you take a species-rich, well-functioning meadow and convert to a solar park, maybe there is a bit of a loss. It is doing the right thing in the right place.



Q78 **Chair:** I am intrigued to know whether the CPRE has a view on whether that can be good for biodiversity or not.

Paul Miner: We do have concerns at the moment that what local authorities aren't looking at sufficiently is the issue of habitat. There was a major case in Devon, in which our local group was involved, with the loss of some of the best and most versatile land but also the loss of some Culm grassland, which is a quite rare and diminishing habitat in that part of the country. I wasn't satisfied that that issue had been properly considered. When you are looking at the suitability of land for development, and particularly when you are looking at the nature conservation dimension, you have to look at habitats, not just at particular kind of species or kinds of grasslands. You have to look at the—

Chair: It may be a topic for some valuable research that somebody might like to do.

Caroline Lucas: Can I say one quick thing? I am so sorry, I had forgotten that I also have a very small number of shares in Brighton Energy Co-op, which I need to put on the record as well. They are so small it is irrelevant really, but that is just for the record.

Chair: Thank you very much. The last set of questions is from James Gray, some of which you may have covered already.

Q79 **James Gray:** Maybe I have, maybe I haven't. The technology is fast developing and we heard earlier that the second-hand value of panels is virtually nil. Given that those two things are the case, and given that most planning permission is being granted for 40 years for solar farms, do you think there is any likelihood at all that after 40 years the land will be returned to nature, particularly given the financial structure of most of the solar companies?

Dr Armstrong: For me, that is the million dollar question: what is going to happen after? They might get repowered during that 40-year lifespan as the efficiency of the panels goes up. They might become permanent structures. Yes, what happens is a million dollar question for us.

Q80 **James Gray:** Would you accept that there is at least a risk that what was previously an agricultural food-producing field will become a brownfield site after 40 years? It has been there for 40 years; the equipment is all out of date and is all tatty; there have been lots of sheep, and they have destroyed it as well; and there are three broken-down tractors because they have crashed. Anyhow, we will leave that to one side, but would you accept that there is at least a risk that what was productive agricultural land would, by this means, be returned to brownfield sites after 40 years?

Dr Armstrong: I would hope not, because I hope the legislation would be in there that the panels were removed and recycled properly. My understanding is that the vast majority of the sites just have the supporting steel pole driven into the ground and they can be pulled up. There might be one or two auxiliary buildings, but the sites I have been



to are quite small areas. If it is legislated well, I wouldn't have thought that it would turn them into brownfield sites.

Judicaelle Hammond: My understanding is that decommissioning arrangements for solar farms will normally be in contracts with the solar development and also in planning conditions, so there is a high chance that they will have an exit strategy, for want of a better word.

Q81 **James Gray:** It is in planning, that is certainly true, but the developer will no longer exist in 40 years' time. Indeed, at the moment, they are changing hands by the week. The big time Wall Street operators are shifting shares around the place like they are going out of fashion and, therefore, the chance of there being the same developer with an obligation after 40 years is extremely remote. In some places they are putting in place a bond, where the developer has to put a bond down for the redevelopment afterwards or for the removal afterwards. Other places are demanding cash, and the developers are refusing to do that. Do you think there is any merit in either? It may not be something you are familiar with.

Judicaelle Hammond: This is not something I am familiar with. I should imagine that the liability for the ownership of the asset will continue to go with someone even when the developer has gone out of it.

Q82 **James Gray:** That brings me on to the planning system. At the moment local authorities are naturally inclined to turn down applications, by and large, particularly where there is a large quantity already. There is a great question as to whether or not a cumulative effect counts or each application is considered separately. Would you not agree that the people who ought to be deciding whether these solar farms should be allowed in very large quantities should be local people through the planning system? Is that a reasonable presumption? Nods—everyone seems to think that is a good idea.

That is not happening because, at the moment, nearly all applications are turned down and go for appeal. The Planning Inspectorate in Bristol are the people who decide whether a particular solar application should go through, and nearly always local objections are overruled by the Planning Inspectorate. Do you think that is fair?

Paul Miner: We believe it should be primarily a local decision, but at the same time, if we were going to move towards a more brownfield approach or rooftop-first approach, there are further changes to planning policy that we think would be beneficial to achieve that.

A problem that we see time and again when solar farms are allowed on appeal is that, at present, the planning practice guidance says that local authorities should look for brownfield sites first; if there are no brownfield sites, they should go on to greenfield. What we see time and again, especially in more rural areas where there are virtually no urban areas and hardly any urban brownfield sites, is that the local authority will say,



“Well, there are no brownfield sites in this local authority, so we have to give it planning permission.”

We think there needs to be a more strategic brownfield-first approach, like there was in planning policy for housing during the 2000s. That should also apply to energy development now, so that you are doing a strategic cast-around for the big industrial estates and other places where you can do much more to mount solar on new developments.

Q83 James Gray: The NPPF is being redrafted now, I think. It is coming out later this year, if I remember rightly. Presumably CPRE will be lobbying like mad to make sure that the brownfield preference is in there. Incidentally, in front of this Committee, George Eustice—when he was Secretary of State for DEFRA—gave evidence that he thought 3a and 3b land is not used for solar. He later corrected that when he realised that, in the NPPF at the moment, it is 3a but not 3b. Presumably, particularly CPRE would hope that some of these restrictions would be in the NPPF.

Paul Miner: We certainly want to see a stronger brownfield-first approach in addition to the more strategic approach I was talking about.

Another area that I think the Committee could usefully look at is how you can encourage local people to do more. There is a very good example in Kendal in the Lake district, where the town council, as part of its neighbourhood planning process, has been doing an audit of side-facing roofs in the town. This approach is now being copied by other towns in the Lake district. We think the Government should look at making that approach standard across the country.

Another reason why that would be valuable is because, compared to Germany, we have a very small amount of solar deployment on rooftops. We mentioned it in our written evidence, but there is something like 40 GW of solar development on rooftops in Germany; it is massive. That is nearly half of what we want to try to get in this country. Partly it has done that due to subsidies, but also in Germany there is probably much greater public and individual awareness of the importance of tackling climate change and the benefits of installing solar panels. If you add an exercise where town and parish councils, or even local authorities, went around saying that you would be encouraged by the planning system to put up more solar panels on your roof—“We can do it, and we can encourage you to do it”—that could be a real game changer in getting more rooftop solar deployment.

Q84 James Gray: It is a switch from agricultural land to rooftops and industrial and brownfield. It makes an enormous amount of sense, doesn't it? I cannot think why anyone would disagree with that. The CLA might, because you own it all. There is a lot of money in it, isn't there?

Judicaelle Hammond: It is not just the money, although I was going to touch on income, but is it going to be enough, given the demands? That is the question. I think that there is a real problem with scale, and I can



HOUSE OF COMMONS

see why people faced with several hundreds or thousands of acres of solar panel would find it difficult to accept. On the other hand, would they prefer to be in the vicinity of an additional nuclear power station?

Q85 **James Gray:** It is not either/or, is it?

Judicaelle Hammond: Unfortunately, this is not either/or. We do have a climate crisis and we do have an energy crisis on our doorstep. I think that one of the questions is, what do we want as a society? The other issue that I—

Q86 **James Gray:** Not really. We are talking about local people here and objectors to applications. The people of Wiltshire have a nuclear power station just down the road in Bristol, but it is not a question of either/or. It is not a question of, "If you don't allow this two-acre application to go through, you are going to get a power station." Of course they are not. It is not either/or.

Dr Armstrong: It is nationally.

James Gray: We are not talking about national; we are talking about local. The thrust of these questions is all about local objections and whether or not local objections are valid. Incidentally, there was a statistic earlier on that 91% approve—but not when it is their area. That is rather like saying 100% of people like houses.

Caroline Lucas: It was precisely when it was in their area. The evidence we received in the first half was precisely that it was in the area. People's approval of their solar farm went up after it had been constructed, compared with before.

Chair: I am going to bring in Barry Gardiner, who is patiently waiting while we have this debate among members of the Committee.

Q87 **Barry Gardiner:** Do we have any data on what percentage of applications go to appeal? My colleague James Gray's point was that this is not decided at the local democratic planning committee—that they all go to appeal. We need to know how many go to appeal and how many are decided through the local democratic planning committee.

James Gray: Yes. A slight qualification there, Barry, is that, of course, many of them do not go to appeal because the local authority is concerned about barristers' costs, so it allows an otherwise unacceptable—

Barry Gardiner: James, sorry, I don't want to have a discussion between us, but it seems to me that the vagaries of the planning process apply to all planning applications. I just wondered if anybody has any data about the percentage that do go to appeal.

Chair: I think the previous panellists might, and perhaps they might write to us with that data. That would be very helpful. I don't want to turn this into a free-for-all. Unless anybody on the panel wants to



comment on that point from Barry—

Dr Armstrong: There was a paper written—it is referenced in my evidence—by Roddis et al. I think they went through and looked for all the reasons why solar parks were accepted or rejected between 1990 and 2017. They may have collected whether it was done on appeal or not, but you would have to get in touch with those authors.

Q88 **James Gray:** One final thing on local objections. To what degree do you believe that battery storage solutions are particularly unacceptable to local people? We are talking about local people. That is the nature of my questioning. They are very large and very ugly, liable to explode and burst into flames. Do you think the battery storage solutions make achieving solar farm permission harder with local people or not?

Judicaelle Hammond: I think it will very much vary. It depends on size, as you mentioned. They will have to have proper health and safety management plans. It also depends on what the plan is for managing the landscape and the visual impact, because some of them will be screened off and some of them will not. I think it will very much depend. Again, I guess the question is, do people feel that it will be valuable to them in the way that they want to lead their lives with society and decarbonisation? I think that is the fundamental question.

Q89 **James Gray:** Ish. When 2,000 people turned up to the public meeting in my constituency to protest against a battery storage solution, they weren't the slightest bit concerned about climate change. They were concerned about the fact that their village was going to be surrounded by ugly batteries. You are right in saying that that is a consideration nationally and maybe for this Committee, but the questions I have been asked to ask are all about local objections and how they can be dealt with. I think you hinted at one, which was screening. There are all sorts of things that the NPPF could perhaps say about screening, which might make them more acceptable.

Dr Armstrong: This isn't what I do, but I have heard, and there is evidence, about community ownership changing people's views. I was speaking to the climate emergency or net zero officer in our council about the problem they have. They have lots of planning applications coming on land that was set aside for employability or other uses, and they are worried that all the money will flow back to London where the companies are based. It is a levelling-up problem—it is like anti-levelling up. Community involvement and community ownership could help. Again, it is not my area, but that is what I have heard from people I have chatted to.

Q90 **James Gray:** So a section 106-type agreement/arrangement? In other words, if you have a solar farm and you get moneys for local projects, for a village hall or for the—

Dr Armstrong: Or co-ownership as well, so the local community can kind of bid into it and get returns. There is a body of research on that.



Q91 Chair: The community energy group in Shropshire announced last week that it had recently closed financing for community energy schemes for solar, which will be deployed not just in Shropshire but around the west midlands. So it is not being sucked back to London. This was money raised locally to be invested in schemes relatively locally. It was certainly within the west midlands, and I think that is beginning to happen around the country.

Picking up James's point about the equivalent to section 106, in relation to onshore wind and potentially for solar farms have the Government given any guidance to local authorities on the types of framework for community benefit to consent a scheme, such as money off your electricity bill if your home is within sight of a solar farm, for example? Do such schemes or methodologies exist for local authorities to deploy?

Paul Miner: Guidance has been produced by the Department for Business, Energy and Industrial Strategy on community benefits, but that is mainly for onshore wind schemes. The reason why it is a bit complicated to find out more about them is that when renewable energy developments are considered through the planning process, consideration of community benefits has to be kept strictly separate—they cannot be a material consideration in deciding a planning application. None the less, the practice is well established.

We looked at community benefits for wind schemes in some research we did a long time ago—probably about 15 years ago. We found that, in England, the amount that was being offered by developers was significantly less than what was being offered by equivalent developers in Scotland, because Scottish councils had got their act together much more effectively in insisting on higher rates of payment per megawatt of electricity generated. I think that has led since to some improvement in practice in England, but the practice is still very variable.

The other point that we would make is that we agree that community benefit should be kept separate from whether a scheme is acceptable in planning terms. But at the same time we would be more supportive of schemes that help communities address climate change. In particular, we would be supportive of community benefit schemes that paid for roof insulation, micro-hydro or better land management.

Q92 Chair: Would you also support the Committee encouraging Government to develop some framework of best practice for local authorities in advising both applicants and communities as to how the benefit could be shared in some way, rather than it all go to the landowner or the developer?

Paul Miner: Yes, absolutely, but we also agree with Alona's point. Certainly from experience we have had of holding energy visioning workshops, mainly in the north of England, community ownership has been seen as a way of increasing community support for renewable energy schemes.



HOUSE OF COMMONS

Q93 **Chair:** Have you written on that subject or have you given evidence to us or any other Committee on that subject for solar farms?

Paul Miner: I am sure we can write to you, yes.

Q94 **Chair:** We would find that very helpful. Has the CLA done any work on that aspect?

Judicaelle Hammond: Yes, we have, because that is one of the questions that we asked our members fairly recently. With the energy crisis following the conflict in Ukraine, a lot of members have said, "How can I put a small scheme together—onshore wind or solar or a mixture, or indeed small hydro—that would insulate me and the village from the kind of price hikes that we have seen?" What we have observed is that the capital need is pretty large and also the preparation that you need to do before you put a planning application forward is quite expensive.

You get quite a lot of up-front costs and it takes time and effort—as it should and as is normal—to engage the community such that you have a core of people who are seriously interested and are going to get out their bank details when the time comes. It is one thing to have agreement in principle and then another to be able to mobilise. I think facilitation of that mobilisation might be a very good thing to have. If you are a landowner and most of what you do is farming, you don't have either the skills or the capacity to deal with the planning system as it pertains to solar.

Chair: Or the understanding for what would be best practice or what would be an achievable ask on either side.

Judicaelle Hammond: Indeed.

Q95 **Chair:** The reason I am pressing this is because it has happened again in the cluster of applications in my constituency and around my constituency. The local communities felt that there was not any guidance available. They didn't know what was reasonable to ask for the local authority, which has to be done, as you say, in parallel to planning so it doesn't get conflated with planning. My sense was that the Government wanted to put the onus on local authorities; they didn't really want to make a decision, because it could be controversial. This Committee can make recommendations that they then have to respond to, which is why I am pressing you to encourage us to make some recommendations in this area.

Judicaelle Hammond: May I add a recommendation, then?

Chair: Please.

Judicaelle Hammond: I think it is about negotiations with the distributor networks. I think that they are used to dealing with larger projects. I think that, by law, they have to give a quote to people who are asking for a grid connection. What I am hearing from members is



HOUSE OF COMMONS

they are not particularly flexible in saying, “Well, if you are setting it there, it will cost you this amount. If you are putting it 2.5 km away, that would be easier because there is a substation” and so on. That kind of negotiation or dialogue is not happening. They don’t have to, and from what I am hearing, that would be very helpful.

Chair: But that is because there is a queue system, and that is how they operate the queue. They make it excessively expensive because they don’t have the capacity to increase generation within a particular area by more than a very small amount because of the system we have at the moment. I think this may be a topic for another inquiry of ours. Sorry, Dr Armstrong.

Dr Armstrong: I have a recommendation on the environmental side. I don’t know whether you are aware, but the Scottish Executive commissioned a carbon payback calculator for wind farms on peatland and legislated that you have to fill that in if you are putting in a planning app for a wind farm on peatland. That made developers think about where they locate things, how much road they put in and how much disturbance they did. I think that made real changes in the implications for carbon in those sites.

There could be scope for something for solar. The carbon implications are not going to be as great if it is not on peatland, but we are developing a solar park carbon payback calculator at the moment. Even with things like the SPIES tool, that could be legislated. Some developers are very engaged; other developers perhaps want to be engaged, but they are not experts in ecology. Why should they be? They are in the energy industry. It could be very beneficial if there was a tool like the SPIES tool to manage things and to tailor your management actions based on evidence. There is a precedent set up in Scotland with that calculator.

Chair: Very interesting, thank you. James, I am sorry, I jumped in. Do you have anything else?

James Gray: No, thank you. I think I have what I need.

Chair: Do any other colleagues have another question? No? In that case, I think we can call this panel to order. Thank you very much indeed, Paul Miner, Judicaelle Hammond and Dr Alona Armstrong, for joining us this afternoon.