

Environmental Audit Committee

Oral evidence: Proposals for the Seventh Carbon Budget, HC 815

Monday 7 April 2025

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Members present: Mr Toby Perkins (Chair); Catherine Atkinson; Ellie Chowns; Bill Esterson; Barry Gardiner; Sarah Gibson; Alison Griffiths; Chris Hinchliff; Chi Onwurah; Sammy Wilson.

Questions 1-65

Witnesses

I: Professor Piers Forster, Interim Chair, Climate Change Committee, Emma Pinchbeck, Chief Executive, Climate Change Committee and Dr James Richardson, Chief Economist and Director of Analysis, Climate Change Committee.

Examination of witnesses

Witnesses: Professor Piers Forster, Emma Pinchbeck, Dr James Richardson.

Chair: Welcome, everybody, to the latest meeting of the Environmental Audit Committee. I am very pleased to be joined by a number of colleagues from other Committees and, of course, to be hearing from the Climate Change Committee on the seventh carbon budget report that has come out. First, I welcome you all and I invite you, starting with Emma Pinchbeck, to introduce yourselves and your role in the Climate Change Committee.

Emma Pinchbeck: I am Emma Pinchbeck, chief executive of the Climate Change Committee.

Professor Forster: Good afternoon, everyone. I am Professor Piers Forster, interim chair of the Climate Change Committee.

Dr Richardson: I am Dr James Richardson, chief economist.

Q1 **Chair:** Excellent; thank you very much. Until now, there has been a broad political consensus around net zero, but it seems to be more under threat than it has been for quite some time—both in the UK and globally. How concerned are the Climate Change Committee that that consensus around net zero is under threat?

Professor Forster: I think that is one for me to take. I want to begin by saying that this is exactly why the Climate Change Act and the committee were set up. The whole point of the committee is to try to give independent evidence to Government and Parliament, and to do that in a way that considers medium-term targets. It does that to try to avoid short-term politics and the politicisation of action on climate change. I think the evidence speaks really well to our country's success in doing that. We have decarbonised more effectively than any other developed economy, and we have done that at the same time as increasing our own economy. So we have been successful in this work, and we absolutely do base our work on the science. We try to support all kinds of parliamentarians to understand the evidence as much as possible. I was appointed by a Conservative Government, of course, to succeed Lord Deben, and before I had the job, I myself had tried as much as possible to talk to the Conservatives about the action and all about our evidence on climate change.

Another thing to say is that if you look at the way we prepare our evidence, going back to the Climate Change Act, we have to consider the economics, and social and international considerations, in our advice to Government. If you look at the evidence we have collected, we have a really good story to tell, in that we can decarbonise in a way that is good for the economy. If you look beyond the 2040 period, our economy will begin to directly benefit from the action on climate change. So we try as



HOUSE OF COMMONS

much as possible to provide evidence to all parliamentarians so that they really understand the good economic story about decarbonisation.

The last thing I will say on this topic is that we conducted a citizens panel about our work, and the response from the citizens fit in with all the public opinion polls and other things being conducted: the citizens of this country want to see further action on climate change taken by the Government, and they want better communication from the Government about the sort of thing they want them to do. There is a strong public mandate in this country to deliver action on climate change. There is also, based on our carbon budget evidence, a good economic incentive for our country to continue to deliver.

- Q2 **Chair:** Governments change, policies change and individual initiatives change. Government cannot address those issues on their own. The Government introduce policies that they hope the private sector and others will engage with, but ultimately they can only go so far. In terms of the investment in the schemes and changes that will be needed to keep pace with your budgets—whether the sixth or the seventh—how important is the sense that, whoever is in government, there will be broad agreement that we are working towards net zero by 2050, however we look to achieve it? Does it jeopardise the performance of one Government if the sense is that the longer-term consensus is now under threat?

Professor Forster: I would respond to that by saying that a lot of the advice we give involves individual citizens and industry trying to make choices about what they invest in, whether it is installing an air source heat pump or driving an electric car. By giving evidence, we do not want those different choices to become political decisions. We absolutely want industry to understand the clear, consistent direction coming from whatever Government is in power at the time.

- Q3 **Chair:** In due course, we will debate the legislation around the seventh carbon budget. What amount of detail does Parliament need in order to facilitate meaningful scrutiny of whether that will be achieved? Was that provided previously with regard to the sixth carbon budget, for example?

Professor Forster: That is a decision outside our committee's job. It is really for Government to decide on the necessary level of detail and what to present. But our committee's opinion is that we want them to provide enough material for Parliament to be able to make an effective decision.

- Q4 **Chair:** As an adviser to the Government and a valued adviser to us, do you think that the level of information provided in carbon budget 6 gave Members of Parliament a serious opportunity to say either yes or no to whether the Government are on target to achieve the objectives that have been set out?

Professor Forster: When carbon budget 6 was agreed by Parliament, the advice on the table pretty much went back to our Climate Change Committee's sixth assessment report. The Government at the time did not come up with their own details about their decarbonisation journey, so they did rely on our report. We think it will be helpful, when the seventh



HOUSE OF COMMONS

carbon budget is debated, that parliamentarians have full oversight and are clear about this Government's own delivery plans. I think that will benefit a more informed debate.

- Q5 **Chair:** Ms Pinchbeck, you told the Energy Security and Net Zero Committee in January that you had written to all the Secretaries of State involved in the delivery of net zero to offer them specific briefings on the seventh carbon budget advice. How many of them have taken you up on that generous offer?

Emma Pinchbeck: I have written you a list, if you do not mind me referring to notes. We contacted the Prime Minister, the Chancellor, the Secretary of State for Business, the Secretary of State at DEFRA, the Secretary of State at DESNZ—DEFRA and DESNZ being our sponsoring Departments—the Deputy Prime Minister in MHCLG, the Foreign Secretary and the Transport Secretary. We had responses from every single one of those Secretaries of State, and we met various Secretaries of State, Ministers and senior officials from all those Departments. We also wrote to the spokespeople or leaders of all the main Opposition parties, and we had a series of meetings and briefings with most of those too, so it has been fairly comprehensive.

- Q6 **Chair:** Yes, that is fairly comprehensive. Were there any Departments where you met only officials and not either a Minister or Secretary of State?

Emma Pinchbeck: I think there were a couple. If you want the information, I can give that to you afterwards.

- Q7 **Chair:** It would be interesting to know whether there were any that offered a meeting with only an official, rather than a Minister.

Emma Pinchbeck: In the main, we were pleased. Normally, my understanding is that we would meet with the Secretaries of State of our sponsoring Departments. This is one of the first times, because of the nature of the carbon budget, that we have begun to meet other Government Departments too. I want to reflect that we thought the way in which those letters were received was very positive, but I am very happy to give you more information.

Chair: We are very grateful and encouraged to hear it.

- Q8 **Chris Hinchliff:** Your advice states: "Sustained shifts away from high-carbon activities are important where low-carbon technologies are not available or will take longer to develop." Clearly, that includes aviation, yet at the same time, the previous Climate Change Committee advice, which was that no airport expansion should take place without a UK-wide capacity management framework, has been dropped. Why is that?

Dr Richardson: The first thing I would say, on the record, is that all our analysis and drafting on aviation was done before the Government's announcements on Heathrow, so we were not aware of that when we wrote the report. In terms of how we now think this is best done, we think that the optimum approach is to ensure that the industry itself takes



HOUSE OF COMMONS

responsibility for getting aviation to net zero. In a sense, what you get there is the same instrument doing double duty for you. By making the industry responsible, it has to pick up the costs for things like sustainable aviation fuels and engineered removals, where there is continued use of jet fuel. Also, the costs of those then serve to manage demand, so the same instrument does both the demand side and the supply side. If you used other instruments, such as constraining capacity, you achieve half that, but you do not generate the revenues then to pay to deal with the residual emissions. We think this is a more efficient way of getting to a net zero solution for the aviation sector.

Q9 Chris Hinchliff: Did the Government seek your advice on how to deliver their airport expansion plans without breaching the carbon budgets?

Dr Richardson: They have not asked us specifically about airport expansion, but they have indicated that they will do so, as part of the process around the airports national policy statement. We await a formal request from them.

Q10 Chris Hinchliff: What are the biggest risks to achieving our carbon budget in the light of the Government's airport expansion plans? For example, London Luton airport has had development consent to move from 18 million to 32 million passengers per annum.

Dr Richardson: Within the aviation sector, the biggest risks are simply that the technologies here, although they are much more developed than they were five years ago when we last offered advice, are still relatively nascent. The market for sustainable aviation fuel is still quite small. Likewise, engineered removals are still relatively early. There are clearly risks around what those technologies cost and how quickly they come through.

Q11 Chris Hinchliff: May I pick up on one particular point on removals? Your report highlights the importance and challenges of addressing non-CO₂ impacts. As we move towards increasing reliance on engineered removals, is there any sign of technology that will be able to address the non-CO₂ impacts?

Professor Forster: Absolutely. Some of the technologies are already beginning to be experimented with. Perhaps the most promising one is contrail avoidance—you can fly aeroplanes at different altitudes to try to prevent them from contrailing, and you can look overall at air traffic control-type solutions. There are also some alternative sustainable aviation fuels that could potentially reduce the amount of contrail, so there are options with that as well. There are solutions out there. If you look at our advice, we assume a high price of carbon, which is to partially account for those non-CO₂ components.

Q12 Chris Hinchliff: You talked about technologies being experimented with and you referred to options. Your report repeatedly highlights technological uncertainties and the need for robust contingencies, particularly in relation to aviation decarbonisation, and especially over the next 10 years. What monitoring does the Government need to do on the



HOUSE OF COMMONS

progress of the aviation sector to ensure that we are on track, and what safeguards and alternative policies should it have in place if the sector underperforms against what is needed?

Dr Richardson: In terms of monitoring, fortunately this is an area with reasonably good data—on the number of terminal passengers and passenger kilometres, which are the kinds of things that we will use as indicators in our annual progress reports. It is a relatively straightforward thing to monitor whether we are seeing the levels of demand that we see in our pathway or whether demand is higher than that. Of course, we can also monitor take-up of sustainable aviation fuels, both the supply side—whether the factories are getting built to make them—and the consumption by the industry.

In terms of contingency plans, the first thing to say is that we have set out our view on a contingency framework across the carbon budget. The nature of the carbon budget is that it allows for swings and roundabouts, so you do not necessarily have to have a contingency in the same area where there may be increases, if there are areas where you can act more easily elsewhere.

We have set out a range of policies in the document that the Government might wish to choose from. Those involve things around demand management, higher rates of charges on the industry or encouraging people on to trains for shorter distances and so on. There is quite a range of different policy instruments. We have not said which particular ones the Government should choose—that is really for the Government—but we have tried to set out what the options are.

Q13 **Chris Hinchliff:** In your annual progress reports, will you come back with stronger advice on demand management if we are off track?

Dr Richardson: If we are off track overall, we will set out what we think the Government need to do to get back on track.

Q14 **Barry Gardiner:** Ms Pinchbeck, can I first put on record my admiration for the work that you do and the way in which you provide Parliament, this Committee and the Government with science-based evidence? Having said that, is Emily Nurse still the head of net zero?

Emma Pinchbeck: Dr Emily Nurse?

Barry Gardiner: Yes.

Emma Pinchbeck: Yes, she is still the head of net zero.

Q15 **Barry Gardiner:** Well, Emily Nurse said—and I quote her directly—“For aviation, there is currently no credible way to achieve zero emissions by 2050.” That was towards the end of last year. How do you reconcile that with this new “everything’s wonderful and optimistic” approach that the committee seems to be adopting, exemplified by what Dr Richardson has said about making the industry responsible for getting there? That is not what this is about, is it? It is about showing what the credible pathway is and showing what the Government needs to do to get there, and it seems



HOUSE OF COMMONS

to me that in this you are absolutely abrogating your responsibility.

Emma Pinchbeck: I think James has covered the change in position well; we think this mechanism is more robust because it is dealing with supply and demand at the same time. As you said, there are contingencies that we offer if we do not see that coming through.

Q16 **Barry Gardiner:** Are there any mandates from Government on the industry to do those things?

Emma Pinchbeck: There is the current SAF mandate, and we participate in the jet zero taskforce.

Q17 **Barry Gardiner:** As you well know, the European report said that only enough SAF would be made by 2040 to meet the increase in demand in aviation, so the emissions would be the same.

Emma Pinchbeck: The SAF mandate is the right tool. On whether it is going to produce enough of the fuel that we need, that is the point of us holding the industry to account and telling you what progress is being made in the annual progress reports.

As we have said in answer to earlier questions, we are not naive about the uncertainties in particular technology pathways. Some of these technologies are at early stages, and where they are at early stages we are trying to give you the advice on where there are uncertainties and alternative tools, but there is enough evidence that we can see of alternative fuels and of removals now that we think the technology can scale.

We also did research with the public across the carbon budgets, as Piers mentioned, and commissioned an independent citizens panel. Some of that advice was illustrative of the measures they thought were appropriate and possible.

Barry Gardiner: That was raising the price.

Emma Pinchbeck: One of them was raising the price on tickets and testing that. Ultimately, they also felt passionately that getting the industry to clean up its own pollution was the right route forward—to endorse what the economics were also telling us. The public were more bullish on demand measures than we have been in our advice. That is true to reflect, and you can see that in the analysis and in the full citizens report. I talked about some of that in the House of Lords last week and it was picked up in the media, but just to be clear, those are citizens panel views.

Q18 **Barry Gardiner:** Exactly, and what we are talking about here is your advice to Parliament and to Government on how to achieve the balanced pathway targets. You have talked about scaling up SAF, but if you do scale up SAF, what impact is that going to have on the other very difficult sector for you: land use and agriculture? What are the implications there? If we look at your coloured bar charts, when we come down to the end we find that the two biggest and most difficult sectors are aviation and land use.



HOUSE OF COMMONS

You are trading one difficult sector off the most difficult sector.

Emma Pinchbeck: There is a chart in the carbon budget that I really love and do to death a number of times. It shows that for the first time we have modelled agriculture and land use together. In the modelling, the assumption—

Barry Gardiner: No, but it is here: “land use, land use change, and forestry”.

Emma Pinchbeck: One moment—if I can just finish.

That gives farmers the potential to, among other things, grow trees and biocrops that fully meet domestically the demand for biocrop SAF in the early years before it becomes a chemical feedstock, and other nature-based solutions, as well as wider land use change, which I think we will come to.

The other thing we have done is look at aviation and its residual emissions in 2050, and propose that it would be the industry that is most incentivised to invest in more expensive removals technologies. In our analysis, industry is responsible for paying both for sustainable aviation fuel and for the removals. Although the sustainable aviation fuel feedstock is a biocrop, it is taken from domestic crop, grown often from a rhizome-based product, which also helps with the soil repair that we need to do for the carbon budgets, but we have fully factored that into our land use calculations.

I want to give Professor Forster a chance to talk to you about the science on aviation, because that has also changed and it is his expert field.

- Q19 **Barry Gardiner:** Before you do that, can you explain why the European report said that the potential growth in SAF, for all the things that you just said, would meet only the increase in demand, and therefore emissions would be the same as they are currently?

Emma Pinchbeck: I confess that I cannot answer that without looking at the report. If you can do it off the top of your head, James, go ahead.

Dr Richardson: The key point is that it is not SAF alone that we see as getting the industry to net zero; it is the combination of SAF and engineered removals, and the combined effect of those two on demand, because they have to be paid for and that affects demand. It is those three things in combination that get the industry to net zero; we are very clear that it is not SAF alone. We are saying that the industry should pay both for SAF and for the engineered removals. That will offset the residual emissions from the fact that SAF is not at 100%.

- Q20 **Barry Gardiner:** What policies from Government are needed to achieve that, and what recommendations should this Committee make to ensure that it happens?

Professor Forster: We have already set out our recommendations in the seventh carbon budget. The first is that the industry has to pay for its own

decarbonisation, which we have just talked about. The second—this relates to the point that Chris Hinchliff talked about—is that if we see a huge increase in aviation demand, there will have to be exploration of demand-side policy directly as well. We have an opportunity when we come back in June and publish our progress report to really go back into this and look at it in more detail.

Chair: Thank you very much. I now hand over to Catherine Atkinson from the Transport Committee, who is guesting with us.

Q21 Catherine Atkinson: I want to ask about surface transport. The Climate Change Committee's pathway on electric vehicles outpaces the zero emission vehicle mandate. How realistic is that? How do you think it will be impacted by the announcements that we think the Government will make, having engaged with industry, to ease the transition and in response to tariffs?

Dr Richardson: We think it is a realistic pathway. The ZEV mandate has been working so far; it was met last year. We saw record EV sales in March this year—nearly 70,000 vehicles. The mandate and the industry, which is putting a lot of money behind this, are moving pretty rapidly towards electrification, and we are seeing the take-up rise very rapidly. We think it is possible to go faster than the mandate once you hit price parity for purchase price. We think that will be achieved some time between 2026 and 2028, with different times for different parts of the vehicle fleet. We are already there in large parts of the second-hand market, which of course is where most people buy their vehicles.

Once you have a car that is cheaper to buy, run and maintain, it is hard to see why people would not move rapidly to that. We have of course looked at countries that are ahead of us. We have looked at the take-up curves in places like Norway and Denmark, which have moved faster than the UK, and used them to help us model the take-up that we think we can see. So it is driven by the economics, and we do see these very sudden transitions in lots of new technologies, as they reach the point where they are just clearly better for consumers.

In terms of the flexibilities, I have not had time to look through all the detail of what has been announced today, but as I understand it, the critical thing is that the targets remain in place. That is what we think is most important, and what has been driving this. There are some flexibilities. I totally understand why, with the trouble the industry is facing from tariffs—nothing to do with net zero, but clearly a hit to the industry—the Government have wanted to ease things like fines and so on. Nobody wants the industry to be paying fines. Without having done analysis, those seem like things that will help the industry but not slow down the transition. We think that this is still moving well, and something where we can be on track for a pretty rapid transition.

Q22 Catherine Atkinson: You mentioned parity on cheaper to run. Do the higher cost of public EV charging points compared with at-home charging, and the uneven distribution of charging infrastructure across the UK,

threaten the pace of transition?

Dr Richardson: It is the uneven nature of the roll-out that is the key challenge here. The overall number of chargers is growing very rapidly—we have seen it almost triple over the last three years—but you are absolutely right that that is not true everywhere. There is a challenge, particularly in some rural areas, and there is more the Government could do there. There is a challenge around people who do not have off-street parking. Most people will charge at home, they do not drive very far on an average day, and that is a very cost-effective thing for them to do.

We have now got the local electric vehicle infrastructure fund. Just today—again, I have not seen all the details—there was an announcement that it would be used to fund 6,000 lamp-post chargers in Brighton. That kind of thing is how you get this done. That means that people can charge overnight at a low cost of electricity, even if they do not have off-street parking. That is already available where I live, and you see a lot of cars plugged in overnight at a relatively low cost of charging.

Q23 Catherine Atkinson: When you say that there is more that the Government can do, in your view, are some of the announcements creating examples of what they can and should be doing to go further and faster?

Dr Richardson: I think that is right. Getting the charging infrastructure there, and giving people, wherever they live in the country, confidence in the charging infrastructure, is a key thing that will help pull through that demand. We know now that these are good vehicles: they have much better range than they had a few years ago, and we are seeing lots of new models coming in. That is really the thing that people want to have confidence on.

Q24 Catherine Atkinson: The take-up of electric vans lags that of cars. Why do you think that is, and what needs to be done about it?

Dr Richardson: There are two key things here. The vehicles themselves have not come through into the market quite as quickly as cars. That is not entirely a surprise, because you need more battery power for a heavier vehicle, and it is the falling cost of batteries that has driven the falling cost of vehicles. With bigger batteries, that comes through a bit later. There is not quite the same depth of market there that you see with cars, and you do not quite have the same vehicle range on some of the vans that there is with cars. That will come, but it may be slightly lagged behind cars.

The other challenge is getting the charging infrastructure, particularly for depot chargers where you need a lot of electricity in a location. We hear a lot from logistics firms that they struggle with two things: planning permission and getting the electricity connection. It is no good saying, "I want to buy a fleet of vans," and the electricity company saying, "It will take three years before we can hook you up to the power network."



Those are the two things that really need to be pushed on. We need to accelerate those planning processes—it may be, for example, that we can make more of these chargers as permitted developments, so that people can just get on without having to deal with the bureaucracy—and we need a more proactive approach from the distribution network operators and the broader set of players, like Ofgem, to get that electricity in place before the logistics operator comes along and says, “I want to put my charge points in.” The answer then becomes, “Yes, of course you can do that,” rather than, “Oh, it’ll take three years before we can connect you.”

- Q25 Catherine Atkinson:** I want to ask a couple of questions about rail. The modelling that you have used does not assume that road freight shifts into rail, although you set out that it could aid decarbonisation as well as reduce congestion. Have you looked at the opportunities that we are seeing, especially in discontinuous electrification? I live in Derby and spend a lot of time on the midland main line, and East Midlands Railway has just invested in new rolling stock that is bimodal; it can travel on electrified lines, but, where that electrification ceases, it can revert to diesel. Given that the midland main line alone is responsible for 48,000 tonnes of carbon emissions, is there not more that we should be doing in moving further and faster on electrification?

Dr Richardson: We do see electrifying parts of the railway network in our pathway. It is difficult to do that very quickly; we do not have a terrific track record of doing that in this country. If we did more of a continuous programme, as other countries have done, I am sure that would speed up over time, but it is a hard thing to push through very quickly.

But that is, in the end, a relatively small part of the overall picture. There is only so much capacity on the tracks, and a lot of that capacity is already used for passenger services, so it can be difficult to see a big acceleration in rail freight—particularly electrified rail freight, because essentially all of it at the moment is hauled by diesels. You would need to replace the rolling stock specifically for freight, and you would need to find those train paths on often quite busy parts of the network, and all of that gets you a relatively small amount of carbon emission reduction. We do have those things in our pathway, but they do take time. They are hard things to rush in the UK.

- Q26 Catherine Atkinson:** I think it is two different things. Certainly, Great British Railways has a duty to expand rail freight, so more should be done on that in any event, but where you have these bi-mode trains, the more you electrify, the less you are having to use diesel. Has that opportunity been explored sufficiently, especially when you can do discontinuous electrification, or is there more that can be done to push the Government in that direction to electrify more and faster?

Dr Richardson: As you say, ultimately it is about electrifying the lines. That is always going to be difficult for branch lines and so on, and it will probably mostly be achieved through technologies like batteries, but that will not work with freight—although it will work for passengers. On the main lines, electrifying is the right answer—it is more efficient, and more



carbon efficient—but the main lines are where you get these challenges about space, or train paths, to put more freight on. The faster we electrify the rail network, the more use we can make of it, but we have to be realistic about the pace at which that can take place.

Emma Pinchbeck: As a shorthand note for the process of doing the carbon budget, the nature of the energy transition is that the economics of electrification are the cheapest thing to do. I used to be the chief executive of the energy trade body, so with that hat on: you electrify everything you can that is economically feasible, and then you do alternative fuels where you cannot, and then you do removals, or some other form of offsets, thereafter. If you can efficiently and economically electrify parts of the line and there is a use for it, absolutely, that is the thing that you do; where you cannot, as James says, you would do alternative fuels or something else. Where there are residual emissions in the economy, that is where we are using removals.

Q27 **Sarah Gibson:** Your report unequivocally states, “There is no role for hydrogen heating in residential buildings”, which comes as a surprise when one thinks of district heating and multiple-occupancy buildings. There is no formal decision by the Government on this yet. Do you think that this lack of certainty is hampering the low-carbon heating transition?

Emma Pinchbeck: First, yes, we are ruling out hydrogen to heat. Part of that, to speak to the answer that I have just given, is that the economics of the energy transition suggest that we should electrify where we can. Supplying hydrogen to all homes that are currently on the gas grid, we say, would require roughly three times as much hydrogen as is currently in our pathway to 2050.

Meeting that demand is likely to be more costly than just electrifying across the energy system, because if we are electrifying and building more cheap electricity, we are also saving losses across the system, so it is a more efficient way of running your energy system. We halve losses in energy across the energy system, using electricity as efficiently as possible.

If we meet that demand for heat using blue hydrogen, there are potential additional missions created. We would stay dependent, possibly, on gas imports, which, given geopolitics, feel like they are adding extra volatility to the economy and likely price exposure. So for a number of economic and practical reasons, we are following a number of other bodies in saying that we do not think it is suitable for domestic heating.

The progress report is due on 25 June, which is when we will tell you more about what we think of Government delivery, and I do not want to preclude that. However, in the progress report in 2024, we said that the main barrier to heat pump adoption was the ratio of electricity to gas prices. I believe that the last time that Piers and James gave evidence to the Committee, they repeatedly said that we need to make electricity cheap. If there is frustration with a lack of progress anywhere on heating, it is really in providing certainty about the cost of electricity going forward.



HOUSE OF COMMONS

What we did for the seventh carbon budget was look at other markets where the roll-out of heat pumps has been successful. Removing other barriers, for example installers or supply chain factors, the biggest factor in the successful roll-out of heat pumps is the ratio of electricity to gas prices. In the UK, electricity is about four times the cost of gas. In most countries where there has been a successful roll-out of electric technologies, that ratio is around 3:1. In our pathway, we get it down to between 2.2:1 and 2.6:1. We do that largely by moving some of the policy costs of electricity. That is one option.

There are other options out there for Government for making electricity cheaper. I believe I was saying that in my last job; I am sure that others are saying it to the Committee. They are saying it to other Committees. We would really like to see progress made there. It is the market's answer to delivering some of this technology, and it would help. That is the primary recommendation.

Lastly, it is not just important for decarbonisation. In our analysis, we think that a household with an electric heat pump and electric vehicle, rather than dependence on fossil fuel technologies, saves around £700 on its fuel bill in 2050, relative to a baseline where we stay dependent on fossil fuels. Similarly, a household that is still exposed to fossil fuels in 2050 is something like 12 times more vulnerable to a future gas price spike. There are very good economic reasons to do this, quite apart from the need to decarbonise.

Q28 Sarah Gibson: I will tell that statistic to my husband, as a reason for having a heat pump and an electric vehicle. *[Laughter.]* So far, he is not entirely convinced by either, so that is really helpful.

The Committee has previously recommended a comprehensive national retrofit program to adapt homes for both net zero and thermal comfort. However, taking into consideration the risks of overheating and of poorly done retrofitting causing condensation, as well as warmth and energy, do the UK workforce have the right skillset to deliver this?

Emma Pinchbeck: I think that the last time that we looked at jobs and skills specifically with the Committee was back when we offered advice on the net zero target. We estimated that there were potential jobs for some 30,000 heat pump engineers.

The Heat Pump Association say that they are training about 9,000 individuals in heat pump installation every year. Some of that will be classroom-based, but that is largely installers who are taking on more than one technology choice and learning about various kinds of heating installation, as well as insulation measures.

They need to have transferable skills, because installers are critical. A lack of skills is an issue across the economy; this is not just about decarbonisation. When I was working in the private sector, it was something that I heard from every area of the economy, so it does need action from Government.



HOUSE OF COMMONS

A lot of those installers will be useful in doing other things as well. It is not just heat pump installation; it is charging point installation, which we have just talked about. We need plumbers, we need welders and we need skilled electricians. That is the way, perhaps across the Government's other missions for things like house building, to think about skills and about the issue of installers for heating.

In the citizens panel, which we have mentioned, installers came up; you have just mentioned your own heat pump experience. The participants in the citizens panel all had anecdotes about concerns about installation, or worries about how that would go, and they wanted installers to give them that comfort. They also wanted reassurance in the form of some warranties, positive testimonials, case studies and greater media coverage. They said that Government's role is to provide certainty. I think we have drawn that out in other answers, but it came back really clearly from the citizens panel, as it has done from other social research.

Confusing messages about which direction the country is going in, about the delivery of decarbonisation and about which technologies or products and services will be used ultimately harm the public's ability to know what they want to do. The panel said to us that they wanted ambition, but they also wanted clarity from Government about the choices available and support with making those changes. That research from the citizens panel is really interesting, and it speaks a bit to that installer question.

Q29 Sarah Gibson: In most of the conversations that I have had locally in forums on retrofitting, the biggest concern is about whether people are going to get interstitial condensation. They do not know what it is, but they know they should be scared of it. That lack of clarity about what decarbonising your home looks like is a big issue.

Emma Pinchbeck: Ultimately, some of that interaction is going to be resolved with a skilled tradesperson who can help people through those conversations. We recognise that.

Q30 Alison Griffiths: Sticking with residential buildings, what elements need to be in the future homes standard to prevent the need for new build homes to undergo retrofitting later on?

Emma Pinchbeck: The homes need to be well insulated, and certainly insulated enough to have an efficient low-carbon heating system installed. They should have a low-carbon heating system installed, so that we do not need to retrofit one later. Also, with the Adaptation Committee's work in mind, these houses should be resilient to future climate impacts in the UK.

The main thing with the future homes standard is to get on with it. It has been delayed, and we would like to see part L of schedule 1 to the building regulations implemented as quickly as possible, as we have said in previous progress reports.

Q31 Alison Griffiths: What effect could rules to limit embodied carbon have on controlling emissions from buildings?



Emma Pinchbeck: This is a really interesting subject, but the way we do the analysis for the carbon budgets means that we would consider embodied carbon in the industry sector of our analysis, so things like cement are dealt with in the chapter on advice on industrial emissions. They are caught there, rather than in the building sector.

What can help with manufacturing processes? Again, it is about electrifying manufacturing processes where we can. But for things like cement or lime manufacture, you are talking about that being one of the uses for an alternative fuel in the manufacturing process to reduce emissions. Plant on site, vehicles and so on are all going to be part of the carbon footprint of manufacturing those materials.

Setting standards around those products in buildings would be likely to pull more low-carbon products through the supply chain, because procurers will provide those standards. For the UK, if they get early certainty over the standards that you need, that would hopefully offer a level playing field to our domestic supply chain. If you are going to set them, you need to consider that, because there are often global supply chains, so you need to have an eye on trade and standards in other countries.

Q32 **Bill Esterson:** I want to come back to what you were saying about your No. 1 recommendation, which is about making electricity cheaper by removing policy costs. Will delaying doing so have an impact on the achievement of your balance pathway?

Emma Pinchbeck: It is a core assumption in the balance pathway that Government take action to make electricity cheap.

Q33 **Bill Esterson:** So how quickly do the Government need to follow your recommendations?

Emma Pinchbeck: As soon as possible.

Q34 **Bill Esterson:** Cornwall Insight says that the Government are going to miss their clean power 2030 target. Is that right?

Emma Pinchbeck: I do not mean to be challenging on this score, but the clean power mission is outside the mandate for the CCC. Our job is slightly different: we are looking at emissions across the economy. Progress on power sector decarbonisation is part of that, but the clean power mission is not. We will be making our report to Parliament in June, and we will say more about Government progress on clean power, but not necessarily on the clean power mission.

Bill Esterson: Okay.

Emma Pinchbeck: I understand that that is an interesting way of framing it, but that is the case: it is not in our mandate.

Bill Esterson: Thank you for your explanation.



Emma Pinchbeck: I should explain why that is. The clean power mission, as the Government have said, is also about things like industrial strategy and pulling more jobs through. Our job is only how fast you decarbonise the economy. We look at the power sector in that context. It is completely legitimate for the Government to have their own policies that do more than that, but those bits of it push beyond, sit outside or are not necessarily in scope of what the Climate Change Committee's job is.

- Q35 **Bill Esterson:** One element of clean power 2030 is the reduction of electricity prices for consumers. At the moment, we have a system in which the cost of electricity in the UK tracks the cost of gas, because gas generation sets the wholesale price. Switching from fossil fuel heating to electric alternatives leaves consumers unable to benefit from the lower costs of producing low-carbon electricity, compared with gas. Is there an alternative in the immediate future, rather than having to wait for the Government to achieve their clean power plan?

Emma Pinchbeck: We think that the Government do need to take further action to reduce electricity prices. What we said in the progress report last year and have said in the seventh carbon budget is that one of the fastest ways they can do that is to remove the policy costs from electricity. The decision to put policy costs on electricity is a Government decision, and therefore it could be changed. It artificially drives up the cost of electricity relative to gas.

Even within that, there are various options then available. You can move those costs on to gas or into taxation. We have modelled two options for that, which you can find in the seventh carbon budget. They show you illustratively what that does across a variety of different household types, but in all cases our aim is to get the ratio of gas to electricity prices down to 3:1 or below. There are wider ideas out there on how you can then reduce electricity prices, in terms of wider market reform, but that sits slightly outside the committee's scope, so we have not made recommendations on those.

- Q36 **Bill Esterson:** So nothing on energy market reform?

Emma Pinchbeck: We have no recommendations on energy market reform.

- Q37 **Bill Esterson:** Are you planning to pick that up in the same way as you were in your earlier answer to me?

Emma Pinchbeck: Please don't make me do energy market reform again, Bill! I've just spent the last five years doing it. There are lots of good ideas out there on energy market reform, and I know it is a lively conversation in the energy sector and with Government. Indeed, it was a significant part of my last job, so if you are interested in those ideas, there are organisations out there.

Bill Esterson: The Energy Security and Net Zero Committee will be holding an inquiry into the cost of energy, so we may have a further discussion on it.



Emma Pinchbeck: The thing to highlight is that there are short, medium and long-term things you can do on electricity prices. I should also say that in the modelling, the up-front investment that we allocate to build new clean power infrastructure in our balanced pathway starts to fall over time and the system costs of electricity fall by around a third between 2025 and 2040. The costs of electricity come down if you do not do anything. Our pathway cost saving is over £15 billion cheaper than one that stays highly dependent on fossil fuels by 2050.

There is a really good story here in the long term about what investing in low-carbon infrastructure does. Your inquiry is going to look at medium-term changes to the electricity market, but there are also short-term questions about what you might do with the levies, which would reduce bills almost immediately and help with the deployment of heat pumps, electric vehicles and other electrified technologies.

Q38 **Bill Esterson:** You have started moving on to another question I wanted to ask, which is about planning. What planning changes are most needed to help the roll-out of renewables and related energy infrastructure?

Emma Pinchbeck: We have made various recommendations on planning in the seventh carbon budget and in reports prior to my time as chief exec. I will give you the list. In carbon budget 7, we had a high-level recommendation on planning for the power sector; we are saying that at a high level we need to be able to build infrastructure much quicker. We have to balance that against local interests, but generally we have to build a significant amount of infrastructure across the country to deliver on net zero and provide secure power to the UK economy in the long run.

Bill Esterson: I understand that. My question is what planning changes are needed, given the barriers in place.

Emma Pinchbeck: Once you get into the detail on planning, it is again beyond the committee's scope, because delivery is ultimately for the Government. In the planning Bill, the reforms to the electricity networks connection process, the reform to speed up electricity infrastructure in Scotland, the cap and floor mechanism for storage technologies, the financial support scheme for community benefits for people living near some of that new infrastructure, some of the technical changes on top of the existing changes that the Government have already made to planning for the demand side of the energy system—your ability to easily install an EV charger or a heat pump—which were made when the Government came into office and the changes to the conditions for onshore wind and the planning framework are all things that would deliver our overall recommendations and are good.

Stepping back a bit, we have previously said that net zero needs to be caught more in planning decisions. The spatial planning approach adopted by Government in the planning Bill and through things like the spatial energy plan is welcome, but it is not always clear that the net zero priority is considered in that more strategic planning approach. We would like to

see some more in that regard. However, the real detail on planning is ultimately for Government to do.

- Q39 Bill Esterson:** The Government are proposing a £250-a-year incentive in response to hosting energy infrastructure, being involved or, presumably, being near it. How effective do you think that payment will be? Do you have any analysis there?

Emma Pinchbeck: We have not done specific analysis on that payment. We said in the seventh carbon budget that you need a mechanism to resolve where there will sometimes be local tension about new infrastructure and the national imperative to build it. There are various ways you can do community benefits and various things you can do for communities to help in that conversation about large-scale infrastructure which go beyond just the financial.

Coming back to the citizens panel, that clarity about what we are doing and why we are doing it is really important. Having dialogue with people about the changes coming is important, almost regardless of the financial incentive that you can give to local communities. We have welcomed it, and it is on my list of things in the planning Bill that we think will help. But again, the specifics are for the Government to deliver. Our job is to acknowledge where there are things Government should look at. We have said that where there are local conditions and national interests, there needs to be something to smooth that.

- Q40 Bill Esterson:** So money off bills or payments, whichever way it comes around, is beneficial as far as you can see?

Emma Pinchbeck: If I put my old expertise back on for a minute, I would say that there are various different models of community benefits that you can look at as parliamentarians, from direct payments to bill relief schemes such as already exist, to community support schemes of the kind that are familiar to you—new sports halls and so on—or other ideas. Those are now very much outside the committee's purview, but there are very good ideas out there in the energy sector and beyond, and there are options available to you.

- Q41 Bill Esterson:** Sticking with the committee's purview, have you picked up any evidence of community payments or payments to individuals that have been successful?

Emma Pinchbeck: We have not looked at it for carbon budget 7. I will defer to James as to whether we have looked at it for previous advice.

Dr Richardson: We have not specifically studied it. I know that, for example, Octopus Energy offers a scheme whereby it will cut the bills of people who offer to host a wind turbine in their area. It says that it has been very successful. It is not something we have specifically examined, but it might be something to look at it.

Bill Esterson: I have probably exhausted this line of questioning.



HOUSE OF COMMONS

Emma Pinchbeck: My former organisation, the trade body for the energy sector, does have information of that kind. I would go and talk to its new chief executive, Dhara Vyas, about some of those options.

Bill Esterson: I am sure we will.

Chair: I will bring in the Chair of the Science, Innovation and Technology Committee.

- Q42 **Chi Onwurah:** Thank you for emphasising how important it is to follow the science, Professor Forster. As an engineer and the Chair of the Select Committee, I take it that that means following and understanding the engineering, particularly when it comes to the role of engineered removals, which are particularly essential to the balanced pathway, as we heard earlier, to support aviation and land use becoming carbon positive.

The seventh carbon budget talks particularly about bioenergy with carbon capture and storage, or BECCS, and direct air carbon capture and storage, or DACS. They are subsets of carbon capture, usage and storage, which in itself is not an established technology—I think you would agree. The Government have announced £22 billion over 25 years for carbon capture, usage and storage, but that is to support industrial growth, not to support BECCS and DACS. What account do you take of that investment? Will it provide indirect support to the business models of BECCS and DACS, and how quickly do those business models need to be established and finalised?

Professor Forster: If you go back to the roll-out we have within the balanced pathway, we begin to see carbon capture storage and removal operating in about three years' time. It will be removing about 3 million tonnes by 2030, and it begins to ramp up after that. By 2040, we have 21 million tonnes of removal, and by 2050, we have 36 million tonnes. To come back to what is needed, that first bit really comes from energy from waste. That is the technology that has to be supported. We then have bioenergy and carbon capture coming in. After time, we have an increase in direct air capture. We also have other technologies in there, such as enhanced weathering and biochar.

- Q43 **Chi Onwurah:** I read that, but I am interested in the business models. You also mentioned the polluter pays principle.

Professor Forster: That is the one thing we do not have from the Government yet. This is where we would like to see, for example, involvement from aviation. We have to see aviation and private industries begin to pay for the deployment of these technologies. There also have to be other things put in place; if you are going to decarbonise cement through these carbon capture technologies, you have to find a market for that decarbonised cement. That is one thing we would really like to see coming from the Government as early as possible—financial mechanisms that really pay for the deployment of these technologies at scale.

- Q44 **Chi Onwurah:** You have set out some of the significant risks, which you mentioned in assessing energy removals, but how quickly do we need to

see those incentives set out to support the business models?

Professor Forster: We have to have them immediately.

Chi Onwurah: That's clear.

Professor Forster: We have to get the technology out in the next two or three years as a timeframe, so we need them now.

- Q45 **Chi Onwurah:** Government policy on energy removals has focused mainly on BECCS—on bioenergy. Should Government be doing more to investigate other novel removal technologies? You mentioned a couple of them, but should the Government be doing more, particularly looking at the research and innovation budget?

Professor Forster: There is a mechanism for the Government to support all these technologies currently. They are supporting direct air capture. They are also supporting enhanced weathering, biochar and things but, potentially, it goes back to your earlier point: the financial mechanism has to be there for cases like the aviation industry beginning to make substantial financial investment into developing those more widely.

Emma Pinchbeck: It might be worth adding a note to say that—this area comes back to the uncertainties point—in the seventh carbon budget, we are being very specific about technologies that are at a very developed level in the market, hence the confidence on things like heat or transport. With removals, we have deliberately modelled a range of options—DAC, biochar, BECCS of different kinds, which Professor Forster has spoken to.

That optionality is important, so I think you are right: we would encourage Government to look at a range of technologies, because that is what to do at this scale of technology development, until we can establish a market winner and drive markets. They need to continue innovation funding, but also to get the business models going to get something to scale. Lots of good demonstrators are out there—we are confident that the technology exists. It is getting through the early stage of technology readiness now out into the market.

- Q46 **Barry Gardiner:** Your advice on the seventh carbon budget notes that the Government have not yet put in place the regulations under section 30 of the 2008 Act formally to include international aviation and shipping emissions. Should it be a recommendation of this Committee that the Government do so forthwith?

Professor Forster: Absolutely. The—

Barry Gardiner: “Absolutely” was good enough for me.

Professor Forster: We would also get a guarantee from the Government that they really would.

- Q47 **Barry Gardiner:** I now want to focus on LULUCF—land use, land-use change and forestry. The Government's consultation on the land use framework suggests that 9% of agricultural land will have to become non-



HOUSE OF COMMONS

agricultural. In addition, they reckon that perhaps 10% must incorporate more climate measures as part of its management. The Secretary of State, however, says that the framework is there to guide landowners, rather than to compel. Is it possible to change one fifth of agricultural land by guiding rather than regulating, given that your "Balanced Pathway" suggests that we need to achieve 50 million tonnes of CO₂-equivalent emissions from that sector in order to reach net zero?

Professor Forster: The first thing is that we are very pleased that the Government have published the new framework guidance. That has been our recommendation since 2018, so it has taken a while, but we are very pleased that they have published it. But you are absolutely correct that in and of itself, it is not sufficient to deliver the required changes. The first thing is that it is just a framework for England, but it is just as important to have a look at the necessary changes across all the devolved Administrations.

The other thing is that very clear certainty is needed on the public finances related to supporting our farming community and land-use managers to change. If you talk to them, they really want the certainty, but other provisions, skills and things need to be worked on in that community. Then there also has to be stuff on the demand side, potentially, like supporting alternatives to meat, things in supermarkets and so on.

Q48 **Barry Gardiner:** Let me bundle two points together. First, will the Climate Change Committee make a response to the consultation itself?

Professor Forster: No, we will not respond directly, but we have definitely been talking to DEFRA about it for a long time, and we absolutely will continue to engage with DEFRA.

Q49 **Barry Gardiner:** You spoke about the mechanisms that are going to be required for the peatland restoration and additional woodland. That is certainly required to meet your balanced pathway, because a huge amount of that is in peatland and forestry. Together, they probably even exceed livestock emissions reductions, such as methane reductions. What financing will the Government put in place to achieve this? You said that there would have to be measures to encourage landowners and farmers to do it. What recommendations should we be making about the nature of that encouragement? Where is the balance between regulatory compelling and jovially encouraging?

Professor Forster: We have talked to farming communities all around the UK, and they absolutely do not want it prescribed to them what they have to do. They want to be empowered to make the best decision for their own farms and farming communities. Our recommendation is that the financial mechanism should be incentivising and empowering them to make the right choices. In particular, we already have schemes like the ELMs and the landscape recovery pilots, so financial mechanisms are being explored, but they have to be taken up more privately. The best way of doing that is to put raw public funding behind them to make sure that farmers are incentivised, for example, to free up their pastoral land to plant more woodland.



Q50 Barry Gardiner: I would like to pursue this further with you, but I think I need to move on because the Chair is looking at me sideways—maybe we can talk about it afterwards. You talked about farmers, and you have said that a 27% reduction in cattle or sheep is needed by 2040. That is fairly blunt, but it is because of the methane emissions that come from them. That is a steep ask of the sector, and its response to you has been, “Look, we produce to very high standards. Maybe we should be persuading people in other parts of the world not to eat the meat that they produce but to eat our meat instead.” Basically, it is a growth and export-led argument. Does that actually meet what is going to be required to reduce our emissions by that amount? If we cannot get those emissions down by 27% in that sector, what is the compensatory area that we will have to look at in order to meet net zero?

Professor Forster: There are things that you can do to directly reduce methane from your livestock production: you can have better animal husbandry, and you can intensify your production in certain locations to make the farming as efficient as possible. One prospect that we are particularly excited about as a committee is the feed additives that have the potential to directly reduce methane from livestock. There are things you can do there, and the advantage of some of the intensification things is that you can take some pastureland out of production and use it for nature-based recovery.

Q51 Barry Gardiner: The more you go towards intensification and corral the livestock together, the more you increase the need for steroids, hormones and other interventions, but that is perhaps another conversation.

Finally, if we are going to prioritise livestock reduction, should we prioritise it in particular areas of the country, looking at the land use framework? We need to set aside the land that is best to be used for lowland heathland, forestry or peatland restoration. If we are setting that aside, would that not have to be by compulsion, rather than anything else?

Professor Forster: That is not something that we have directly looked at as a committee. We have not looked at the detail of the Government’s land use framework—what goes where—but you absolutely ought to make the most efficient use of the type of land you have in different parts of the country. We have talked to land managers, and they absolutely do not want to be compelled; they want the right financial incentives to do that. The Government can support that through things like the carbon border adjustment mechanism to help protect the industry from high-carbon imports that might compete with them.

Q52 Barry Gardiner: The problem with the CBAM, though, is that unless you put that money back into the developing countries, you are in effect putting a tariff on them and becoming protectionist, so the other countries will never be able to afford to decarbonise in the way we want. So CBAM is a double-edged sword, isn’t it?

Professor Forster: We can talk about trade all day.

Barry Gardiner: Well, you raised the carbon border adjustment

mechanism, not me.

Professor Forster: We have said that it is imperfect. The best thing is to have high-quality product standards.

Q53 **Chair:** Further to that point, in the light of your figures, if we were to see a large part of our agriculture going over to renewable technologies, more tree planting or any of those things, but we continued to eat the same amount of meat—if we had a 27% reduction in what we produced as a producer of agriculture, but basically offset that by bringing in all that meat from overseas—would that achieve your target even if the UK were causing the same amount of methane?

Professor Forster: That is absolutely not what we are recommending as a committee. The carbon budget has—

Chair: Sorry, my question is not about what you are recommending; it is about achieving those targets. Would the UK be on target if it produced 27% less meat but still consumed exactly the same amount?

Professor Forster: The emissions targets are territorial. If those meat products were imported from other countries, they would not count for that target, so we should still meet our budgets. However, it is not the committee's advice to do that at all. We have observed changes in diet over the last two years. Between 2020 and 2022, the amount of meat and dairy consumed dropped by 10%. Our advice includes changes in diet that are commensurate with what we have observed.

Barry Gardiner: But your target is for a 27% drop in emissions from livestock, not a 27% drop in meat consumption or livestock. It is the emissions from the sector.

Professor Forster: The 27% is emissions from the sector.

Q54 **Ellie Chowns:** I raised the question of territorial versus consumption-based emission calculations last time you were before the Committee. It is clear that the question is of interest to the Committee. We have a responsibility as legislators—we have a territorial emission-based framework, but consumption-based emissions are a key part of the picture. We need to keep attention on that while recognising that it is not your statutory role.

Professor Forster: But it is something we track.

Q55 **Ellie Chowns:** I would like to move on to some questions about the cost of the transition—I am aware of time. Dr Richardson, your report estimates the net cost of transition to 2050 as roughly £4 billion a year on average—0.2% of GDP. How confident are you in that estimate?

Dr Richardson: We have pretty high confidence in most of what underpins that. The big picture is replacing inefficient high-carbon technologies with more efficient low-carbon technologies. We have the costs of most of those technologies—renewables, electric vehicles, heat pumps—in the market. We have quite a lot of evidence now about the

falling costs of those technologies over time. Those things make up most of the cost part of the pathway. We are pretty confident in that because there is a lot of data.

We are also confident in the savings you get on operation costs for those because we know what the wind costs and what the sun costs. We know that you are not buying oil and gas. There is one big uncertainty in that part, namely that the cost of oil and gas itself is uncertain. If we had another big price shock, you would see a bigger saving relative to the higher cost that could come through.

There are parts of the transition where the costs are less certain. We have talked about things like sustainable aviation fuel and direct air capture. They are smaller parts of the overall cost because they are smaller parts of the overall pathway, but it is important to say that the costs of those technologies are much more uncertain because they are more nascent.

Q56 Ellie Chowns: My overall reading of your advice is that you are getting increasing certainty about both the costs and the benefits in financial terms of these technologies as we move towards the transition and as technologies come to maturity.

Emma, sometimes it is hard for people to translate these costs into real terms. If we translate 0.2% of GDP into 0.2% of the average salary, that is £60 a year—a fiver a month or just over a pound a week. That sounds to me like an absolute bargain—does it not to you?

Emma Pinchbeck: I would add to James's answer that not only are we more certain that the costs are coming down; I think I am right in saying that the costs have broadly come down every time we have offered carbon budget advice to Government, because the technology has become more certain. Generally, as technologies scale, costs come down—this is not brand-new economic analysis. In this case, in the seventh budget we are more confident about the economics of electrification generally. That has halved the costs overall in the pathway compared with what we said in carbon budget 6, where we talked about 0.6% of GDP as the overall cost of the pathway. That is important.

For what it means for ordinary people, I draw attention to two bits of analysis. One is that it is helpful for people to understand that the savings start to accrue in the economy in 2040 and run out through 2050 and beyond. Because of our mandate, we model out to 2050, but not beyond that. But there are often one-off costs of infrastructure upgrades or home upgrades that accrue over the next decade. We have to make those upgrades, but, once we have made them, we will start to make savings. These technologies are often modern, more efficient and less reliant on expensive fuels, so the savings just run through the economy. I think people understand the idea of investing to save money in the long run. They also understand economic security.

I was in post working directly with the energy sector in the energy crisis, and people absolutely understood how vulnerable we were to gas price shocks. Bills are still at record-high levels, with record-high amounts of



energy debt sitting on consumers in the energy sector because of that price shock, so I think they understand the idea that being immune from future fossil fuel volatility is good for the economy as well. There is a very clear narrative on that in the seventh carbon budget advice.

Lastly, we have modelled household bills and worked out what they look like for the typical household. As I said, a typical household in 2050 will have a £700 saving on bills, largely because they will be using fuel more efficiently to heat their home. They will also have a £700 saving on driving costs, because they will be driving an electric vehicle rather than being dependent on a more expensive fuel to run the car, plus some other operational savings on electric vehicles. That is a good story. Critically, that is all quite a long way off, which is why the recommendation to make electricity as cheap as possible is important. The sooner you make electricity cheap, the sooner households benefit.

Lastly, you might ask us about this, but for the first time, we have also done a distributional impact assessment. Again, we spoke about that in the Lords last week. That basically assesses the impact of our recommendations for various types of household, whether that be our recommendations on flying, heating systems or electric vehicles. Broadly, almost every single type of household benefits from the transition relative to a world where we stay dependent on fossil fuels. There is some very powerful storytelling and impact analysis across different kinds of household at different income levels, in different parts of the country and with different technology mixes, which I also recommend to the Committee.

Q57 Ellie Chowns: From memory, from your reporting, net costs will peak at around £33 billion a year in 2029, but net benefits will be about £33 billion by 2050 and then, as you say, increase way into the future. There are huge benefits to be had from early up-front investment, which will have a big pay-off. That is without even taking into account the co-benefits, such as the health benefits from cleaner air, or the benefits from avoiding loss and damage associated with climate disaster; this is an insurance policy as well.

It is striking to me that those figures—£33 billion and £33 billion—are quite similar to the £28 billion that, a couple of years ago, Labour was talking about investing in the green transition. Unfortunately, that has disappeared off the horizon. I hear what you are saying about private investment needing policy certainty and pump-priming from the Government most of all. Can you say anything about the urgent need for Government investment to pump-prime the broader transition that we need, and for them to make the point that investing to save is what this is all about?

Emma Pinchbeck: I will cover what investors need, based on more than a decade working in the private sector, and then I will hand over to James to talk about the proportion of public and private capital that we have looked at for our analysis.



HOUSE OF COMMONS

Speaking entirely from the experience of my previous jobs where I was working on behalf of the private sector and talking to Government about what they needed, I know that the primary recommendation repeated over the last decade has been clarity. I have long admired the carbon budgets, as someone who has largely worked in private industry, because they offer long-term certainty, but they are not prescriptive in terms of technology choice or even decadal targets. They are an envelope of outcome in the economy, set 12 years ahead of time, so investors get that long-term clarity about the direction of travel, but they are not being told what exact technology mix is required to deliver it.

It is important to say that when we deliver our pathways, they will simply illustrate that that eventual budget is achievable. We will be surprised at the things that come forward from the private sector through the carbon budgets to deliver these outcomes. Part of the joy of them is the partnership between public and private working well.

In a similar way, to answer the first question about the debate on climate change in Parliament, my experience from my last job is that the biggest consequence was not really on institutions like the Climate Change Committee that take a medium to long-term view. It was often on immediate investment into the UK, because investors do respond to those signals from Government. One of the most powerful things that parliamentarians can do is to offer that clarity and direction, and allow the market to do its job. Firmly from the experience of having done that job in the private sector, I would say that there is a definite role for clarity and certainty for Government.

In terms of what we have modelled for the capital deployment, I turn to James.

Dr Richardson: We see most of this resource coming from the private sector and that really reflects the fact that, for a lot of these big pieces of technology, we are past the pump-priming point; the pump has been primed, often by taxpayers in the UK and other countries. We now see that renewable electricity, electric vehicles and—potentially, subject to the point that we keep saying about making electricity cheaper—heat pumps are becoming cost-effective technologies.

Q58 **Ellie Chowns:** Retrofit?

Dr Richardson: Retrofit is cost-effective for most cases—not the big, really expensive solid-wall stuff, but most of the measures that we would have in our pathway for energy efficiency are cost-effective, because heating bills are so high at the moment. You save money quite quickly on those things.

There certainly is a role for the state in supporting the more nascent parts of this—things like engineered removals. We have talked about business models there. Some of that is about creating the certainty that there is an income stream. That income stream may be a private sector income stream, but the state can create certainty about it—and in some areas,



that may be about direct public support.

There are some choices in what the state chooses to pay for and how much it gets the polluter to pay, and those are for the Government to decide. But overall, the big investment story here is increasingly one of investing in technologies that make sense on their own economic terms, regardless of all the points that you have rightly made about the co-benefits, such as the impact of that on mitigation and adaptation costs, and so on.

Renewable electricity is basically the only thing that people are building any more, because it is cost-effective. Electric vehicles are increasingly going to be the cost-effective choice. We are going to see private money coming into those things, subject to having the right environment of certainty, because if there is one thing the market hates, it is political uncertainty.

Emma Pinchbeck: The exact proportion that we have offered in advice is 60% to 90% of that figure that you gave coming from the private sector. That is quite a big range. The reason for that speaks to the difference between, for example, a clean power mission and the carbon budgets, in that some of the policy choices that Government make may be about choosing to drive the market faster for other reasons, for example industrial policy. We talked about the automotive industry earlier. There are reasons for the Government to take decisions that go beyond decarbonisation, and we have tried to reflect some of that uncertainty in what the market then does versus what Government does. You have to have a big range, because each Government has a different kind of take on what its job is in the market.

However, the big message is that, as James said, this can be a private, capital-led transition and the Government need to get the framework right and offer confidence to the market to get that capital moving.

Q59 Sammy Wilson: One of your recommendations is that, given the magnitude of the change and the sacrifices we are asking people to make, there needs to be an effective community strategy of communication. Reading your own executive summary, do you accept that in many cases the message that is coming out is at best ambiguous and sometimes even misleading? For example, in your executive summary you start off saying that energy prices should come down, something that the Secretary of State has repeated. Then, later on in that summary, you say that maybe the cost of your electric vehicle will offset your increased electricity prices. There seems to be there a message that is conflicting and that is not always conveyed to the public.

We have also had the discussion about land use. There is no indication that, of course, we already are far too reliant on foreign sources for food; 60% of our food is produced locally. We are now going to devote—what?—10% of the countryside to solar panels and peat bogs and forests and so on, all of which will reduce the ability to produce food.

Do you think that the Climate Change Committee and indeed the Government have been up-front with people in the United Kingdom about



the sacrifices, the costs and the dangers of this policy?

Professor Forster: Perhaps I will kick off this time. I am probably the person here who is the most responsible for the executive summary, so, if it was ambiguous, I do apologise. I think there are some straightforward things to communicate, but I also think that there are some more complex things to communicate. There is the fact that we are paying more for our energy currently, but we expect that, in time, the energy prices will drop, so it depends what timeframe you are talking about.

I think it is also important to communicate that you do have an up-front cost with the transition. You have to go out and buy an air source heat pump, for example, but then, over the time of running it, you expect the cost of the bills from the air source heat pump to reduce. Then it is all about the necessary contexts of the day-to-day decisions that individuals and companies will make, for example.

As a committee, we try to do that honest communication. We try to present it as, "There are going to be costs, but you are going to save." That is what we have been asking the Government to do as well; we do need some very clear communication. We need to first explain to the population why we need this transition—because of the big effects of climate change that we are experiencing, and to make our energy system more secure, as Emma talked about—and then we need to tell people what they have to do: "Go out and install an air source heat pump," or, "Go and buy an electric car," for example, when their car gets to the end of its lifetime. Then we need to empower them to be able to make those changes. I think we need clear communication.

Q60 **Sammy Wilson:** But even with your message there about, "Well, get your heat pump, which will be reliant on electricity, and get your electric car, which will be reliant on electricity, but don't worry; the price is going to come down.", the caveat that has even been given to us today is that, with the up-front capital costs for the infrastructure, and the fact that we are going to have to run a dual system, with gas power stations as back-up when there is no wind or solar available, the price will come down only if those costs are shifted to some other place—namely, to your pocket, through your taxes, rather than from your pocket through your electricity prices. The policy costs will be transferred somewhere else.

Those are the kinds of issues that I am not so sure the public are aware of. They are told, "Wind blows; it costs nothing," and they are all taken in that we are going to get cheaper electricity prices. Indeed, the current Minister has of course fallen afoul of making that kind of promise and not being able to deliver on it.

Professor Forster: That is not what we say as a committee. We are not getting everyone in the country to go and buy a heat pump tomorrow; we are saying, "When your gas boiler gets to the end of its lifetime, consider installing an air source heat pump," and, "When your car gets to the end of its lifetime, consider buying an electric car".



Emma Pinchbeck: To pick up your point on electricity, because my specialism is energy—that is what I spent the last 10 years or so doing in the private market—I think you are right in that people do not make hay with the difference between energy prices and energy bills. What we are talking about in that executive summary is the wholesale price of electricity coming down over time. That will happen because you are putting a cheaper producer on to the system, and renewables will start eating into the wholesale market—analysts disagree on when, but around the early 2030s—so, over time, out to 2050 the electricity price will come down.

That is slightly different from the bills that people pay, because on the bill there are things like standing charges, VAT and policy costs. The recommendation that we are making on policy costs, is that by choice we have allocated those policy costs on to electricity. They are less than 10% of the bill, three quarters of them are for investment in infrastructure, but there are other things in there too, such as social tariffs—the warm homes discount, for example. Our proposal in that regard is that, rather than just leaving electricity prices to get cheaper over time, we also need to tackle the fact that we are effectively putting in extra costs on to the fuel of the future. That stops markets doing what they should be doing, which is investing capital themselves to get these electrified technologies under way.

Is that easy to explain in two sentences to someone? No—and, as Professor Forster has said, we recognise the need for much better communication on this. We are the technical body to advise parliamentarians. We have recognised the need for good communication; I do not think we are necessarily the people to go and do that communication with the public, but hopefully we are giving you the information so that you as parliamentarians can do that. We would be very happy if you could think of other recommendations for us about how we can clearly articulate these recommendations.

Q61 Sammy Wilson: You also recommended that buy-in should be a two-way process, enabling people to feed back. If one of the ways of pushing towards a target—whether for heat pumps, EVs, or infrastructure—is to have changes in legislation to either mandate the sale and production of certain kinds of cars or heating methods, or to reduce the ability of communities who are affected by infrastructure changes to have an input into the planning process, does that not make the two-way communication process seem a bit superficial?

Emma Pinchbeck: On the nature of prescription versus incentive, one of the things that is notable about the seventh carbon budget advice is, if we go back to the conversation about flying that we had at the start of this session, in general in every area of the economy we have looked for what the market forces are and pushed them as far as possible in terms of incentivising the market to deliver the economically efficient outcome, rather than prescribing things like behaviour.



HOUSE OF COMMONS

We recognise that it is about offering people better services and modern technologies in a fair and aspirational way, as soon as possible. That is the nature of this advice, and we recognise that it is probably a helpful thing to do. I cannot comment on the changes to planning because they are for Government. But we recognise the need for local communities to feel involved in decision making, to benefit from this infrastructure, and to understand the changes. One of our primary recommendations is the need to communicate at every level.

Q62 Sammy Wilson: One last question: you have said that the cost is about 0.2% of GDP. I think Stern measured it at 3% of GDP. How did the costs fall so quickly?

Dr Richardson: There are two things that are going on here, and they are both important. First, the technologies have got better at a faster rate than we or others—including the people who you might have thought of as their best advocates in the environmental movement—predicted. We have just seen really dramatic falls in the costs of many of these technologies. The cost of something like a battery has fallen by 90% over the last decade or so. These are extraordinary technological improvements, and they have brought down the cost of the pathway. Secondly, part of what has happened is simply that we are further through the pathway, so some of those investments have taken place and do not need to be repeated.

Q63 Barry Gardiner: How much more would it cost if we did not transition?

Dr Richardson: We do not have a direct estimate of that, because it depends on whether the world follows us or not, but clearly the costs of unmitigated climate change would be much higher. Stern came to that conclusion even with the higher costs of the transition, and it would be much more so today.

Q64 Chi Onwurah: Following on from Sammy's points about communication, and particularly communication to the public, one of the things that is pretty hard to explain in two sentences on a doorstep is the seventh carbon budget—I haven't tried yet. Particularly my constituents in less affluent areas have a negative impression of the policies around climate change—as being constrictive and restrictive on where they can take holidays, what they can eat and so on—so I am particularly interested in your citizens panel exercise. How useful did you find that? Did you find attitudes like that? How do you see the role of such panels going forward?

Professor Forster: Perhaps I could speak to that first. Every time we do a citizens panel, we find it very informative; the citizens give some answers you expect, but they also give answers you do not expect. With this panel, they all took the threat of climate change really seriously, whichever background they came from. They want clarity from Government. In some cases, they were prepared to go much further than the committee in recommending things like frequent flyer taxes and the polluter pays principle.

Absolutely, they are concerned about their household bills, and I think they are keen to understand the connection between all these:



HOUSE OF COMMONS

Government action, household bills and what we do about climate change. There are huge opportunities to communicate more effectively about why we are doing it, the way that we are doing it, and exactly what it will do to their bills and things.

- Q65 **Chi Onwurah:** One of the things I notice is that those with a great desire or need to take action to reduce their carbon footprints—particularly young people, but not only them—are confused about what action might be best. What are the top three actions that people can take to make the biggest impact in reducing their carbon footprint? To counterbalance that—because I do feel very strongly that my constituents should not be guilt-tripped into taking responsibility for climate change, rather than Government or the private sector taking responsibility—how does individual behaviour compare with the actions that Government and the private sector could take?

Professor Forster: The first thing to say—we had a look at this—is that about a third of emission reductions come from the choices that individuals and households make, and two thirds of them have to come from what wider society, industry and Government choose to do. That is the first thing to say: it far more behoves the rest of the society than individuals to act.

The other thing to say is that, for a typical household—it does depend on the demographic—the most important thing is to think about installing an air source heat pump when their old gas boiler gets to the end of its lifetime, and, when their car eventually gives up, to replace it with an electric car. I was going to say that the third one would be to have a look at our carbon budget advice—it is obviously not very intelligible. I would say we need to talk about it: talk about it to your friends; talk about it to your MP. We have to create understanding.

Chair: Thank you very much. This has been another excellent session. Thank you so much, both for the work that you are doing and for your evidence today. We are all very grateful.