HOUSE OF LORDS

Environment and Climate Change Committee

Corrected oral evidence: Climate Change Committee

Wednesday 2 April 2025

10 am

Watch the meeting

Members present: Baroness Sheehan (The Chair); Lord Ashcombe; Lord Duncan of Springbank; Lord Jay of Ewelme; Lord Krebs; The Earl of Leicester; Lord Mancroft; Earl Russell; Lord Trees.

Evidence Session No. 1 Heard in Public Questions 1 - 17

Witnesses

I: Emma Pinchbeck, Chief Executive, Climate Change Committee; Dr James Richardson, Director of Analysis and Chief Economist, Climate Change Committee.

Examination of witnesses

Emma Pinchbeck and Dr James Richardson.

Q1 **The Chair:** Good morning, and welcome to the Lords Committee on the Environment and Climate Change. Today, we take a short break from our nitrogen inquiry and instead take the opportunity presented by the recently published seventh carbon budget to have before us the newly appointed CEO of the Climate Change Committee and its director of analysis and chief economist. At the moment, we have just one witness in front of us but we are assured that Emma Pinchbeck, who has been the victim of transport delays, will be with us shortly. We look forward to welcoming her in a few minutes.

I remind everyone that the session is webcast live on Parliament TV and that a transcript will be taken and made public. Witnesses will be able to review the transcript and make minor amendments, with the agreement of the clerk. I remind members and witnesses that any relevant interests should be declared the first time they speak. We will make a start and rearrange the order of the questions.

I see that Emma has arrived, in the nick of time, as I was just about to ask the first question. I will give you a few minutes to settle yourself while I move on to a question we planned for James.

Emma Pinchbeck: That is fine. Give James a hard time for two minutes, while I catch my breath. Thank you.

The Chair: Excellent, we will do that. I warmly welcome Emma Pinchbeck, CEO of the Climate Change Committee, and its chief economist and director of analysis, Dr James Richardson. I thank them for taking the time to be with us today. Would you introduce yourselves and then we will move on to Lord Krebs's question about costs and benefits in putting together the seventh carbon budget?

Emma Pinchbeck: I am the chief executive of the Climate Change Committee. I have been in post since November last year. Prior to that, I gave evidence to this committee and others as the chief executive of the trade body Energy UK. My background is largely in the energy sector. I have been delighted to work across the economy for the seventh carbon budget and other things.

Dr James Richardson: I am the chief economist and director of analysis at the CCC, where I have been for about two years. Although I do not see him here today, I should perhaps declare that Lord Layard, who is a member of this committee, was my PhD supervisor. If I get the economics wrong, you know where to look.

The Chair: We will quiz him when he joins us after Easter. He is unfortunately unable to be with us today.

Lord Krebs: I declare two interests. I was a member of the Climate Change Committee between 2008 and 2017 and chair of the Adaptation

Committee during that period. I am also chairman of Drax's Independent Advisory Board on Sustainable Biomass.

Having declared those interests, I address my question to you, James. What lessons did you draw from the balanced pathway cost-benefit analysis? The analysis shows that the balanced pathway to net zero, over the period between now and 2050, has a net cost of around £110 billion. Could you explain the assumptions that produced that number, and the sensitivity analysis? Obviously, there is a number but there is a spread of possible numbers, and you must have done some sensitivity analysis. Who bears those costs? You say that the majority of upfront costs will be borne by the private sector but I am interested in how they are spread across households, government and the private sector. Finally, the analysis is that the costs will be between now and 2040 and the savings will kick in between 2040 and 2050. Obviously, one discounts future money because it is in the future. In the discussion of the assumptions you made, what kind of discount function did you apply?

Dr James Richardson: I will start with the big picture and then try to work my way through all those points. Fundamentally, the economics of this are that you invest in a new set of technologies, predominantly to replace fossil fuel technologies. Those technologies typically have a higher capital cost than the fossil fuel technologies they replace, although that is not always true, and offer substantial operating savings. That generates the profile and overall picture that we see: upfront investment and downstream savings, basically from not buying oil and gas. There are some elements on top of that where there is a higher cost. Things such as applying carbon capture and storage to cement manufacturing are an additional cost in that production process. Some of the elements at the margins are more expensive across the whole pathway, and it is important to recognise that. The balance of those factors then gives the figure that you quoted. We think it is around 0.2% of GDP per year on average.

On how that is constructed, it is a bottom-up analysis. We develop our pathway across the sectors of the economy that generate emissions, such as transport, electricity generation and buildings. We have models for each of those that look at what a cost-effective pathway to net zero in that sector would be. The costs are then generated from that. For example, with the residential building sector, which is quite a large part of the overall cost, we have a model of the housing stock that has several thousand different archetypes of housing. Treatments are applied in the model to each of those. You apply a different amount of energy efficiency measures, insulation and so on, and different home heating systems—typically a heat pump, but it will be a different size for different-sized buildings. For the treatment that suits that archetype, there is a cost for each of those items. That is added up, and then you add it up across the entire housing stock on the pathway that we see as being cost-effective to net zero. That gives you the cost of it. You also look at the operating costs: gas in the counterfactual situation, and electricity in the pathway. The electricity costs come out of our electricity modelling; we model the

entire electricity system. That gives us a marginal, long-run variable cost of electricity—the cost to society of producing that extra unit of electricity. That goes in as the operating cost of a heat pump. The costs are built up in that way.

On the uncertainties, we are pretty confident in some elements, while some are inherently more uncertain. A lot of the pathway is made up of technologies that are pretty established in the marketplace. Most of those costs come from three very large sectors: electricity supply, building and surface transport. In those sectors, the technologies are well established, such as solar panels, wind turbines, electric cars and heat pumps. We have a high degree of confidence in the unit costs of those technologies. We know how many houses and cars there are. There is obviously some uncertainty around population and so on, but we are pretty confident on those things. We are also pretty confident on the pathways for cost reduction. Again, we have quite a lot of evidence on those. Most cost reductions in most of those technologies have already taken place. We have seen 90% or more cost reduction in technologies such as batteries and solar panels. We project further cost reductions using the evidence of the learning rates we have seen.

On the big parts of the puzzle, the main uncertainty is the cost of oil and gas in the counterfactual. That is inherently uncertain. We use the Government's projections for that. Of course, the savings you get on running costs depend on the cost of the oil and gas you forgo. There is uncertainty around that. It is very difficult to do much about that, in that we know that these are very unpredictable markets.

There are then smaller elements of the costs—things such as sustainable aviation fuel or direct air capture for removing CO_2 from the atmosphere. The costs of those are much more uncertain. Those technologies are more nascent. They are not non-existent; we do not include technologies in our pathway that have not reached what is known as technology readiness level 6. These are all things that have proven pilot projects but there is no commercial price for them. There is more uncertainty around them. Fortunately, they are smaller elements of the overall pathway. There is more uncertainty around the small elements and less uncertainty around the large elements.

Where those costs fall will vary across the different components of the pathway. We see most of the costs falling to the private sector. There are choices for the Government in this. We try to reflect some of those choices, where we think we have an understanding of the terms of them in what we have modelled for the possible range of fiscal costs. Some parts are fairly clear: for example, electricity will be paid for by consumers of electricity, as has been the case since its inception; surface transport will be paid for by the owners of vehicles, again as it always has been. With building costs, we think there will be a split between the Exchequer and households. We see that at the moment with the boiler upgrade scheme. We have had it in the past, when we had to undertake large programmes to update housing stock. Although it seems as though

it should be a long time ago, the move to indoor plumbing was substantially supported by the Exchequer even into the 1980s. We think that there is a need for some such support, and that is probably the largest element that falls to the Exchequer.

There are areas such as aviation where we are clear that we think the industry—therefore, most likely, passengers—should pay because approximately half of people do not fly at all. In industry there is much more choice for the Government. Do the Government push those costs on to industry through things like the emissions trading scheme and then try to protect competitiveness with barriers at the border, such as a carbon border adjustment mechanism? Do they use some elements of subsidy, as they are doing with Tata Steel, to bring down the costs and share them across society? Do you set out product standards that would mean that steel sold in the UK must have a certain carbon level? There are choices about who would bear the cost, depending on how you do it, for some of those other elements.

Lord Krebs: Thank you very much. I realise we must keep to a strict time limit so perhaps you could be succinct in responding to this further point. You did not mention discount rates. Could you give us a brief glimpse as to how you deal with that?

Dr James Richardson: We looked at that in three different ways in our analysis. The headline chart that we show accrues capital at the point of construction, so there is no finance in that. We do it that way because it is how the Green Book tells us to look at it and it is how it is done in GDP. We then also produce a version of that chart where everything is discounted at the Government's social discount rate and all the capital has been financed. We use a 3.5% real discount rate, which is relatively high compared to market rates at the moment. When we look at costs and savings for households, we use commercial rates for things such as vehicle finance and mortgage rates for upgrades to buildings. We try to look at those things through different lenses.

Lord Krebs: The £110 billion includes discounting into the future.

Dr James Richardson: The £110 billion is accruing capital at the point of construction with no financing, so that figure does not have a discount.[1]

Lord Krebs: It does not. If I am a householder, I might say, "Well, I've got to spend some money up front by installing a heat pump and it will save me money in future, but I must take a discount from the money I save according to how far in the future it is". That is not in the calculations.

Dr James Richardson: It is not in that piece of the calculation. When we look at it from a household perspective, and say that we think a household will save £700 on its energy bill and a further £700 on its fuel bill but will pay about £700 more for the heating system, that is all

[1] Note by witness: Discount rate

discounted at what we think are the commercial rates that the household will face.

Lord Trees: Thanks very much for coming to give us your wisdom and knowledge. On uncertainties, particularly in residential buildings, which are quite a major emitter, to what extent do you take into account behavioural change affecting the demand side of the equation? Persuading people to turn down their thermostat a degree or two would have a colossal effect. We all need to save electricity. Do you take any of that into account? Do you have a role in advising government in that context?

Dr James Richardson: We take those things into account. They form part of our pathway. We look at both ongoing behaviour change, such as your thermostat example—

The Chair: Very briefly, as we have a question on behaviour change coming up.

Dr James Richardson: We look at it in that ongoing sense of whether you persuade people to turn down the thermostat. Also, our models for take-up of heat pumps or electrical vehicles assume patterns of behaviour by consumers, otherwise the model would trip everybody instantaneously on to the more efficient technologies.

The Chair: Emma, do you have anything to add before we move on?

Emma Pinchbeck: One point on modelling detail is the efficiency of these technologies across the system. That speaks a little to the demand piece, and is really important. We halve energy use across the energy system in our model because electrification is more efficient when you do it across the system. At the CCC we get to look in and around the whole energy system. I think we have more flexibility and a more comprehensive sense of the demand side in relation to the supply side than some other modelling out there, including, for example, what NESO produced for the clean power 2030 plan. You are right that that is one of the powerful economic stories through the advice we offer to government.

On a personal note, coming from my last job I am very up for telling people to turn down their boiler flow temperature. It makes a huge difference to use energy efficiently, as well as to replace the technologies in the system.

Lord Mancroft: When you refer to the cost to the Exchequer—the government cost—what you actually mean is the cost to the taxpayer. That means the private sector, does it not?

Dr James Richardson: Ultimately, all costs come back to households. There is no one else.

Lord Mancroft: It is important to be clear about that. The Government have no money; it is taxpayers' money.

The Chair: We have spent a lot of time on this question but it is important. I hope we will spend less time on the next one. Before we move on to that, can I ask about energy efficiency costs? They do not seem to be reflected in the balanced pathway at all. Is that the case?

Dr James Richardson: There are costs for energy efficiency measures, in buildings and in areas such as industry. They are not very large overall but they are in the pathway.

The Chair: They are in there somewhere.

Dr James Richardson: Yes.

Q2 **The Chair:** We will go back to the beginning and the first question. Emma Pinchbeck, what are your priorities for the CCC during your first year? How do you see the organisation fulfilling its role?

Emma Pinchbeck: Apologies that I was not here to answer the first question first. I now live in a rural constituency, which in itself is interesting.

We have a number of statutory duties. You will be aware of them, but I will start with those. We have just advised the Government on the seventh carbon budget, which is UK-wide. Following that, we offer advice to each devolved Government. Northern Ireland has had advice and we are about to issue advice to Wales and to Scotland. There are supporting materials as well. Some of the information on our methodology for seventh carbon budget and the devolved Government reports will be available publicly once we have advised all the devolved Governments. James and the analysis team are preparing those reports, so that people can see how we came to our conclusions. On top of that, we have progress reports due this year on how the Government are doing in delivery of both adaptation and mitigation. We are preparing the big report for adaptation, the climate change risk assessment, due next year. The analysis work is running through now.

The Chair: Is that a regular report? I know there is a lot of money allocated towards its production.

Emma Pinchbeck: That is right. It is a regular report, in that we produce it around every four[2] years. We are meant to advise government under the Climate Change Act through a climate change risk assessment or similar assessment every four[3] years, in a similar way to the carbon budgets. The big thing is looking across the economy, analysing the risks and offering advice to policymakers. We get a particular grant from Defra, one of our sponsoring departments, to prepare that report. It is slightly differently funded from the equivalent work for carbon budgets, which I would like to resolve. Yes, a significant amount of money is given to us to prepare that analysis. We are the statutory body for producing adaptation risk assessments for the whole of government. That is the

[2] Note by witness: five years
[3] Note by witness: five years

function of the adaptation committee. Work on that started before I arrived. It is a year's-worth of work.

Those are the main statutory reports. On top of that, operationally we are waiting for the Government to appoint us a new chair. While as chief executive that chair will by my boss, and so I cannot really influence the process, it would be good to get that chair in place. The chair sets the wider work programme and influences, along with the committees, how the statutory reports are delivered. The chair also confirms committee members and ensures that we have the right committee members in place.

I mentioned funding but would like to clarify our funding arrangements for 2025-26. Like every other government and quasi-government body, we wait to see what the settlement will be on the other side of the spending review. I hope, this time, for a multiyear settlement, which will allow us to plan more effectively the use of public money to produce these statutory reports over years. We have had a series of annual funding settlements, which is not very efficient, speaking as a new chief exec looking at the numbers.

The Chair: I am quite interested in that. You know that you have certainty going forward, so I am not quite sure why the exact figure—

Emma Pinchbeck: Not currently. I am waiting for confirmation on some of our funding arrangements, including for the adaptation report. Obviously, that has been signalled in previously committed money this financial year.

The Chair: Is the £6.7 million budget for 2022-23 not final?

Emma Pinchbeck: We have had all our previous funding confirmed. I am waiting for the 2025-26 money—this financial year—to be confirmed in some instances by our sponsoring departments. Beyond that, I am looking for a multiyear settlement for the next iteration of our statutory reports.

For the last few years, before my arrival, the committee operated mainly on annual grants from government. For understandable reasons, those were often late to be confirmed. As chief exec, that is quite a new situation for me to manage. It would be more efficient to be able to plan things over multiple years. Other bodies have been in that situation and able to plan over multiple years. In the past, the CCC had multiyear settlements.

The Chair: What sort of work does that impact in the Climate Change Committee?

Emma Pinchbeck: Most of our resource goes on expert staff, such as James, in the analysis team and our other teams. Anyone who has run an organisation will tell you about the amount of resource it takes to recruit and retain staff, particularly if staff are your main resource. Largely, it is that. If we do not have long-term certainty in our finances, we have to

offer lots of short-term contracts and constantly recruit for roles. We cannot offer certainty to excellent and expert staff. In a specialist body, that is a particular challenge. There is a lot of competition for those kinds of staff as well. It would make a big difference to our ability to plan resource effectively, and we would spend less of our resource on recruitment and retention.

Q3 Lord Duncan of Springbank: You will be aware that, last year, Climate Earth and Friends of the Earth successfully challenged the Government over their climate change plans. The Government have committed to coming back by October with revisions. What does that mean for the Climate Change Committee itself?

Emma Pinchbeck: I do not know what it would mean for the Climate Change Committee. I saw the public announcement that the Government have been given more time to produce the plan for that court case. The response to the carbon budgets is the Government's job. Under the statutory requirement, they have a year to respond to seventh carbon budget and legislate a target, once they have had time to consider our advice. We are not involved in that.

Lord Duncan of Springbank: I would have thought that it was quite a blow for the Government of the time to be told that their climate change plan was not up to scratch. That was not ideal. Clearly, they will have to do something to bring it up to scratch, but we are in a very changed world from when this process began, with a lot more challenges. The anticipation of these challenges would have presumably been a tightening of the budget, making it much more robust, as they would see it. Now, there is every possibility that the Government will do exactly the opposite. They might see this as an opportunity to look at timelines and a different timescale, which would have implications. There is such flux now that we could see a situation where, if they change the timescales, it will change almost the fundaments of the way in which you calculate your budgets.

Emma Pinchbeck: The short answer is that we are the statutory body that responds to the targets set in law. Until such time as those targets or the law change, we will not change our advice. On top of that, we have just issued the seventh carbon budget advice. We might come on to this, but we have excellent working-level relationships with officials. We are very cognisant that they must now produce advice in response to that court case. We have reissued advice.[4]

You talk about the world changing. That is true, but, as James outlined, the world has also changed in positive ways. Some of the technologies that have come forward did so faster and are cheaper than we may have anticipated when we advised the Government on the sixth carbon budget. There is change. How that is reflected by the Government in their plans for delivery is for them. We recognise that they have a lot of work to do before they legislate the next target.

[4] Note by witness: The Government will need to respond to this advice.

On the wider conversation about the role of the CCC and the legislative targets, our advice is set in line with science. The net-zero target was advised in line with science. I imagine that we would continue to say that, but we also serve the targets set in law and by Parliament.

Lastly, on delivery, if we had something to say about whether the Government's pathway was not in line with Parliament's legislative targets, we would say it in the progress reports. That is the mechanism for us to advise you on that. We have a progress report due in June this year and there will be one in June next year.

Lord Duncan of Springbank: Presumably the court case said that it was not in line. That was the whole point of the court case.

Emma Pinchbeck: Yes, and I think our progress report also said that government delivery plans were not in line with the carbon budget. In that way, we aligned. That is for the Government to resolve. We will say in the progress report this year what we think of current government progress. Indeed, we will do so for next year, once we have seen all the plans, including by then, I think, those for the seventh carbon budget.

Q4 **Lord Ashcombe:** Before I start, I declare an interest, albeit a vague one, in that I do work in the insurance industry for energy companies, predominantly in North and South America.

How did you approach the overall process of putting together the seventh carbon budget and the balanced pathway? What other factors did you weigh up? Added to that, to what extent is there a risk that including only one pathway, as opposed to the multiple you had in the past, leads to uncertainties?

Emma Pinchbeck: It is probably appropriate for James to answer that, given that he started that work several years before I arrived.

Dr James Richardson: Fundamentally, we seek to develop a pathway that is both feasible and cost effective. We look at the cost-effectiveness of what I will call in a broad sense low-carbon technologies, but that includes things such as behaviour change—things that would decarbonise parts of the economy. We look at the cost-effectiveness of those against the Government's carbon value. Measures enter the pathway at the point at which they are cost effective against that carbon value.

We also look at feasibility, such as how quickly you can ramp up the take-up of these technologies. When will something such as carbon capture and storage technology be available that I can then plug a power station or cement plant into?

What is somewhat different with the seventh carbon budget from previous ones is that more and more measures are cost effective already against almost any carbon value; an electric vehicle, regardless of the carbon value, is a cost-effective choice. If you just used the cost-effectiveness test, you would jump to 100% electric vehicle take-up instantly, and that would be true of a lot of the rest of the pathway. The

feasibility constraints now become much more important in determining the shape of the pathway. We put more effort into modelling those, based on take-up of past similar technologies and take-up in other countries. With heat pumps, where the UK is behind, we have quite a lot of evidence from other countries about the shape of those take-ups. The feasibility constraint has become more important, not everywhere—not in aviation—but across the bulk of the pathway. Those are the predominant considerations.

The Climate Change Act sets out a range of other things that we are required to consider. For example, we triangulated our technocratic view with the views of citizens, through a citizens panel. We asked people what they thought would be acceptable and affordable. We triangulate against sources like that. Obviously, we look at the science and at the UK's international commitments. That anchors the whole pathway on net zero 2050. We look at things such as costs and fiscal, which we talked about before. The things we have to look at are set out in the Act.

Emma Pinchbeck: From engaging with parliamentarians through the seventh carbon budget process, I think describing what the pathway is for is important. Often, there is a notion that our pathway is a single point of truth or is prescriptive, and therefore there is nervousness about there being only one. As James said, the pathway is there to illustrate that the carbon budget value we recommend to Parliament is feasible. I come from a private sector background, and one thing I have always liked about carbon budgets is that they are not particularly prescriptive relative to other climate governance. They are not hard technology targets or decadal targets. That allows for a certain degree of innovation, uncertainty and indeed surprise in their delivery. Ultimately, the final delivery pathway is for government. The CCC does not, for example, have wider responsibility for things such as industrial policy.

I always think a good example is the automotive sector, where our pathway, quite rightly, assumes that there will be a cheap electric vehicle available in the market because we can see them already available in the market internationally. That is a slightly different question for government from whether it is a cheap, UK-manufactured vehicle, which would sit more inside industrial policy and use a different set of policy mechanisms, where you weigh up slightly different things; how you might then determine your overall delivery on the questions of carbon, cheapness to consumers and industrial policy. That is important to describe.

Our pathway exists so that you, as parliamentarians, can be sure that the budget number that you legislate is feasible. How that is eventually delivered is a question for government, with our advice. Also, we should allow for the innovation that will ultimately come through the market. I say this all the time, but no one thought that offshore wind would be the primary delivery technology for the first three carbon budgets, yet it has turned out to be exceptionally important in our energy mix.

Coming from the private sector, I like the carbon budgets because they allow for innovation and for us to be surprised. It is important to clarify that that is what the pathway is there to do.

Lord Ashcombe: What safety factor do you build into your assumptions? You look a long way ahead. There must be some variation in your minds, even though you go for a number.

Emma Pinchbeck: Apart from the arguments that James and I continually have in the office about technology rollouts, along with the rest of the team, I draw your attention to something that may be a fast way to answer the question. There is an uncertainties chapter in the seventh carbon budget advice, which pulls together a description of the methodology used by James and the team for those uncertainties. As he said, generally there is more certainty around some technologies because we can simply see their prices in the market. Again, a good example is that we can see them rolling out electric vehicles and heat pumps in other markets.

The wider uncertainty involves things such as the price of gas or where we have novel technologies that are maybe only at technology readiness level 6. They are there and will develop in the market. We asked the model to produce options in a way that it perhaps would not if it just looked at the cheapest technology at this stage of development. All of that is described in the uncertainties chapter in the advice. I think there will be more when we do the methodological report.

Dr James Richardson: There will be more in the methodological report.

We think it is really important that the Government have contingencies. Uncertainty is inevitable, and we try to set all of that out, as Emma said, but we also set out the kinds of things the Government could do if they find themselves off-track. Of course, those look different in different parts of the pathway. We think it is important that the Government have a set of levers that they can pull if they find themselves off-track. In some ways, that is as important as understanding the uncertainty.

Q5 **Lord Duncan of Springbank:** The citizens panel is always an interesting concept. It depends on when the citizens meet and the circumstances when they meet. If a citizens panel met a couple of years ago, what they thought at that time and what they would think right now could be completely and fundamentally different. My slight issue is that take-up is dependent on human behaviour, which is dependent on ambient circumstances. Given the troubles in the world today, which we would not have anticipated even a year ago, some of those assumptions may not be accurate. Even allowing for the flexibility that you have built in, the level of churn across the globe is so great that it might create greater problems than you anticipated.

Emma Pinchbeck: On the citizens panel, that is right, because of course we all respond to the environments we are in. Actually, there has been remarkable consistency in various social studies, including by Climate

Assembly UK, our citizens panel and the polling that many organisations do with the British public on how they feel about the environment. Generally, their desire for ambitious action on something that is just about the environment drops as the cost of living becomes more challenging. The economy directly affects whether it is a top five or a top three issue. But in many of the things they say I think there is remarkable consistency.

More broadly, a significant recommendation—I am not allowed to say primary recommendation—that the CCC makes for the seventh carbon budget, and it was in our progress report last year, too, is that we need to make electricity cheap. The analysis team leaned heavily into technology development and replacement, rather than behaviour change in the first instance, because we recognise that, if you can make things easy, cheap and convenient for people, they are likely to do it regardless of their feelings about climate change.

Lord Duncan of Springbank: I suppose the thing I struggle with is what James said about the notion of electric vehicles. Frankly, people should be at nearly 100% take-up because they are ultimately cheaper and so forth. While you are right about the assumption that there will be cheaper electric vehicles, they will come from China. The EU is not ready to accept cheaper electric vehicles, so almost certainly there will be tariffs.

The Chair: We have a question on that.

Lord Duncan of Springbank: Forgive me, Chair, I am nearly finished. In that circumstance, your assumptions would be tested. It is quite possible for a citizens panel to say that it makes perfect sense in the scenario you present but the reality is quite different.

Dr James Richardson: Briefly, I do not think the reality is that different, because a lot of European manufacturers are now bringing forward quite low-cost electric vehicles. The Renault 5 E-Tech was launched this week, I believe. Yes, China has been driving this, but a lot of other companies, including companies based in Britain, are on this pathway, because that is the technological choice, and it will come out in the market, regardless of approaches to China.

Emma Pinchbeck: We could go down a rabbit hole on this quite quickly.

The Chair: We are talking about the process of putting together the budget. We have questions about each sector. Earl Russell and Lord Krebs have supplementary questions, but only if they are relevant to process, please.

Earl Russell: I am interested in what you said about the relationship between hard targets and innovation. It is important that a lot of this is set up to allow space for innovation. Specifically on heat pumps, we have a technology that is in the market and available—

The Chair: We have a question later devoted to heat pumps.

Earl Russell: I will leave it until then.

The Chair: Lord Krebs, is your question on process?

Lord Krebs: No.

The Chair: Lovely. I have a question on process. The Climate Change Act requires the Secretary of State and the Climate Change Committee, when they take decisions and develop advice on carbon budgets, to take into account developing scientific knowledge and new technologies. Methane is a greenhouse gas 80 times more powerful but much shorter lived than carbon dioxide, and could, if it is reduced rapidly, slow down warming air. As we see climate impacts, weather-related events, increasing in ferocity and frequency, did the Climate Change Committee consider recommending stronger, faster action to mitigate methane? I cannot see it reflected adequately where you mention agriculture, waste or fossil fuels.

Dr James Richardson: We look at each gas separately, and you can see the pathway for each of those gases set out in chapter 3 of the report. We consider all those things. With methane, some areas are easier to act on rapidly than others; for example, with leaks in the gas system measures can be applied fairly quickly. To reduce methane in the agricultural sector, ultimately you need people to change their diet. If you simply reduce herds in the UK but people eat the same amount of meat, you will just import it and the climate will be unaffected. We need quite significant changes there, but it is important to recognise that that is likely to be quite a gradual process.

The Chair: We probably do not have time to go into it now but I would welcome some written evidence from the CCC on methane.

Emma Pinchbeck: To be clear on agriculture, methane is in the agriculture pathway, which is one reason why livestock is highlighted as the biggest source of emissions from that sector. We will follow up in writing.

The Chair: Maybe I can put further questions to you on the way you looked at reductions in methane there and whether that was optimised.

Q6 **The Earl of Leicester:** My declaration of interest is that I have agricultural land in Norfolk. I have invested in every type of renewable energy except wind, and have a portfolio of residential and commercial properties.

How do you expect the Government to respond to the seventh carbon budget report? Have you received any indication that they might publish proposals for associated policies ahead of the vote on the level of the carbon budget? I then have a couple of supplementary questions.

Emma Pinchbeck: As I said earlier, statutorily, they need to legislate for the seventh carbon budget before the end of the next parliamentary

year—so by next summer. They have not told us whether they plan to publish their policy suite before or after they legislate.

The Earl of Leicester: I appreciate that it is established by law, but has the Climate Change Committee considered a possible large change in policy if Reform wins the next election—or indeed the Conservatives, in view of what Kemi Badenoch said two or three weeks ago about not stopping net zero but delaying it?

Emma Pinchbeck: No. We are the statutory body that responds to legislated targets. Our job is to advise government and then report to Parliament. Until there is some sort of change in Parliament, I do not think we would change how we operate. It is worth saying that, because we advise Parliament, we wrote to every political party in Parliament, including Reform and the Conservatives, to offer our advice on the seventh carbon budget. We sat down with many leaders across Parliament, including caucuses in the Lords, to talk through our advice. We will carry on doing that work with all political parties.

The Earl of Leicester: But it is something you may have to expect and change.

Emma Pinchbeck: Were there to be a change, I imagine the CCC would have to respond, because we are the statutory body in the Climate Change Act. Until there is a change, we do our job under the law.

The Chair: Going back to the question Lord Krebs asked at the start, the overall cost-benefit analysis does not include co-impacts such as improved health outcomes from better air quality—co-benefits, really. Is that reflected adequately early on in the report? It is quite important, is it not?

Emma Pinchbeck: There is a figure for co-benefits in the analysis, starting from £2.6 billion[5]. We can follow up in writing.

Dr James Richardson: It depends on how you treat the rebound effect on electric vehicles, but we do separately calculate it. The reason we keep it separate is simply that the Act requires us to set out impacts on the economy, so our costing basis is done in line with market value—the economy piece. We do the co-impacts separately, to make sure that what we do is in line with the Act. It is certainly included. As you say, air quality is probably the largest co-benefit of all of it.

The Chair: Along with protection of ecosystems in the natural environment. To me, that is quite an important co-benefit of your committee's work on the mitigation of climate change and adaptation. I am not sure that I saw it adequately reflected when I glanced through the report, which is weighty.

Emma Pinchbeck: I interrupted; I am sorry about that. I was going to say that there will be more on the costs and benefits of nature and the

[5] Note by witness: £2.4 billion

broader impacts on the economy in the adaptation advice when we offer it.

As CEO, I wonder whether there is a way we can bring together, sometimes, the work of both those committees and reflect a broader view. As James says, we are slightly constrained, in that we try to offer our mitigation advice in line with the Treasury Green Book principles and the wider Climate Change Act principles on the accounting.

There is nature in the mitigation report, particularly in the land use and agriculture section, which I think we are going to come on to. Many of the solutions that come from land use are to do with restoring peatland. We are talking about roughly doubling the amount of peatland that is rewetted or regenerated by 2040 compared to today's levels, and increased tree planting, which is up 3% from today for the land covered by trees by 2040. Within that we have been conscious not just to drive the fastest-growing tree types; we said that you need broadleaf and hedgerow planting. The solutions need to work with nature as well, so it is there.

The Chair: I know those measures are in the report, but my question, which I will leave on the table, is whether you have fully reflected the impact of those measures on the well-being of both the planet and people. I am going to go to Earl Russell.

Q7 **Earl Russell:** I want to ask a question on the key short-term and medium-term public engagement priorities for the Government. You have already mentioned the citizens panel that you carried out this time, which I thought was extremely welcome and timely. Could you say a bit more about what came out of the citizens panel? What is the message from you to government on a communications strategy, misinformation and disinformation in this space, and particularly what the public want to see so that they can make the clear and informed decisions that they need to make?

Emma Pinchbeck: Another very big recommendation from both the progress report last year and in the seventh carbon budget, which comes from our economic and social research, is that we need clarity on the options for people going forward. In particular, at household level, a third of the emissions reduction for households[6] comes not from behaviour change or the things often written about in the press, but from the choice of having a heat pump when you need to replace your heating system and having an EV when you replace your vehicle. That is not well understood, and that came out in our social research and more broadly. It is a big shift, so we need the public to understand that. We also need them to understand that we are not talking about scrappage; we are talking about at the end of life of their technologies.

More broadly, the other thing that comes out from the research is that people are uncertain generally about what we are trying to accomplish

[6] Note by witness: 72% of those emissions

and about the economic case for net zero, and they want government to tell them what we are doing this for in a more positive way. They are very up for change. When you speak to the public, they understand that climate change is happening, and they are worried about it. They are particularly worried about economic resilience, but they are not getting that message from policymakers at the moment. When there is uncertainty in the broader narrative and debate, it tends to manifest in people not feeling that they can act. We see that quite clearly in our work with the public.

There are two things that I will particularly highlight, the first of which picks up the earlier point. The idea that the UK's action is science based is important, as is communicating why we are doing this and the potential impacts to the UK, the UK economy and to households, and how the carbon budgets work in that regard.

The second thing is the economic case for net zero. The economic story that James has outlined is actually pretty good. We have halved the costs of the transition since the last time we advised government in the sixth carbon budget. Many of these technologies are now displacing fossil technologies, not because of decarbonisation but because of an energy transition that is under way. Remaining dependent on gas exposes people who have a gas boiler in 2050[7] something like 15 times to a future gas price spike than if they had decarbonised their homes. There are some really poorly understood economic reasons for doing this that we would like to see better communicated.

It has been done. I used to be chief executive of the energy trade body, and in that role I can tell you that, at the height of the energy crisis, people really did understand that their bills were going up because of gas. They absolutely understood that. They were very frightened by it. They felt out of control in that situation. They were worried about gas volatility. That message has dropped off a bit, but many people are still struggling with the after-effects of that crisis, so there is a need for government to articulate some of this in that context. That is a personal view. It goes slightly beyond our advice, but it is also in the advice.

Earl Russell: I understand. Obviously, people are struggling with the continuing cost of living crisis. Accessibility, affordability and equability were key things to come out of that report. Generally, the message behind the report is that the Government are not particularly communicating their vision and their strategy and the transition. Although there is public support for climate change policy, there is confusion about what it means for them personally and how it impacts them.

Emma Pinchbeck: As well as the communication, part of the reason I personally repeatedly keep banging the drum for cheap electricity prices is that you can speak to people about the change and what is coming, but you can also make it easy for them, regardless of that conversation, by

[7] Note by witness: 2040

making these technologies attractive and easy for people to have in their lives. Cheap electricity benefits people who are struggling with their energy bills right now. It then helps you build the case for cheap renewables. People start to put the big change for infrastructure and for these technologies together with cheaper bills, and that helps you build a case for it, almost regardless of what you tell people.

It is a mix. You have to get your policy right so that people start to feel the benefits as soon as possible. On top of that, historically, the Government have not been good at communicating what this is all for. They were quite good at it at the height of the energy crisis, because it became about energy security and costs. We need to carry on in that vein.

Earl Russell: Very briefly, cheaper electricity prices sit outside your remit, do they not? The Government are generally looking at zonal pricing and some electricity market reform.

Emma Pinchbeck: That was most of my life in my previous job. It is not why I chose to move to the Climate Change Committee, but much less of my time is spent debating the exact market design.

There are lots of bright people across the energy sector—economists and policymakers—all of whom have various options on the table for reducing the price of electricity; for example, medium to long-term market reforms of the kind you are describing or short-term interventions, such as moving some of the levies off electricity. It is not our job to advise on exactly how you do that, but there are lots of ideas out there that government could take advantage of.

Lord Ashcombe: This rather follows on from what you were just saying. When you have your citizens round tables—I do not remember quite how you referred to them—do you think there is an understanding in this country of the environmental and social levies on the wholesale price of particularly electricity, because it is very significant? If people realised what some of this is costing, there might be a bit of further debate, which is what I think you are saying about trying to get the message across better. I do not think people understand the split of their electricity bills.

Emma Pinchbeck: I will take that question in two parts. First, people generally do not understand the energy system and energy costs, including what they are for and what is behind some of those charges. That is from the experience in my previous job of trying to explain why costs were going up.

Secondly, when we were talking about all this with the citizens panel—and leaning heavily on my experience in the last job through the energy crisis—it was not that people did not want to pay for the infrastructure; they understood that gas was a significant problem for bills in the long run, and that most of the increase on your energy bill is due to the price of gas. They understood the need to invest in alternatives to that

domestically and that, for national security, you might want a different portfolio.

Lord Ashcombe: This is an environmental levy on the bill in addition to the wholesale price. It is not due to the gas.

Emma Pinchbeck: No, but that was just to answer your question about how they felt about paying. They were fine about investing from bills or taxation or somewhere in the economy in new infrastructure. They saw the need for that to bring down the wholesale part of their bill, which was their biggest challenge. On the question of whether it should be through bills or elsewhere in the economy, I do not know whether we asked the citizens panel that, but it is regressive to put things on energy bills versus in taxation for fairly obvious reasons.

There are various policy options available to government about whether you move that levy on to gas or into taxation or somewhere else, and we as the Climate Change Committee do not have a view on that. What we have a view on is that you should move the levy, because at the moment it is raised on electricity, which is, among other things, the future fuel in your economy, and is having an impact on the private sector's ability to finance things such as heat pumps or to make these technologies cheap for people, and leads to people thinking that electricity is more expensive than it is. There are a number of reasons why we think as a committee you should move the levies. How the Government do that is up to them.

From the public's point of view, they would be supportive of moving levies off their bill—they would save money. They also think it is fairer to have it funded in some other way. The exact proportional split, how you do that and over what timetable is for government to decide. Have I missed anything, James?

The Chair: We look forward to the Government's response to seventh carbon budget and the parliamentary debate that will take place. That is where we will be able to air our views and flesh out the Government's intentions more succinctly. Is your question related, Lord Duncan, to public engagement?

Lord Duncan of Springbank: It is related to the answers that we have had.

The Chair: Let us carry on, because we have quite a few things that are coming up.

Lord Duncan of Springbank: If you will forgive me for a moment, I just want to make a point. It is helpful to do it here, otherwise we get confused and it may get lost.

One of the challenges that I think is being alluded to right now is that, if you possessed a heat pump and you had paid it off, you would receive benefit. The challenge in a period of economic difficulty is that you must also be able to invest in the upfront costs, which make it more difficult for people who are fearful for their income. The challenge in this time more

than any other is that people are not feeling comfortable to make those bigger investments, even though, over a 10-year period, they will see the benefit.

The Chair: We have just about half an hour left to cover more than half the number of questions.

Lord Duncan of Springbank: I would be useful to get the answer to that. Forgive me.

The Chair: There is a question on heat pumps.

Lord Duncan of Springbank: It would be useful to get the answer, since the question has been asked.

The Chair: Very briefly. If witnesses have anything to add, let us save it for when we get to the question on heat pumps.

Emma Pinchbeck: On the savings point, it is worth saying that the reason why we are keen to move the levies off electricity, and in general the mission for government with electricity, is to get the ratio between gas and electricity prices down to about 3:1. It is higher than that in the UK. In most markets where we have seen the rapid electrification of heat, the ratio has been about 3:1. That is the point where you can make the business case for the heat pump stack up, and then you can start to finance it. If you are in the private sector, you can start to offer innovative tariffs and the rest. That helps answer your question about how people can access the technologies. It is also important for the business model. I turn to James, on the capital costs.

Dr James Richardson: The really short answer is that the boiler upgrade scheme has been successful at addressing that. We saw an increase in that, to £7,500. That is surely one of the reasons why we have seen a 60% growth in heat pump sales last year.

The Chair: We have a question on heat pumps coming up, so can we leave heat pumps?

Emma Pinchbeck: We can come back.

The Chair: I want to ask you a little bit about the panel itself. I understand that one of the several conclusions from the panel was that "different policies were acceptable for choices seen as necessities as opposed to luxuries". Can you say what were seen as necessities and what were seen as luxuries?

Dr James Richardson: At the highest level, heating your home and surface transport, especially people getting to and from work, were very much seen as necessities. Aviation in particular was seen as a luxury.

Lord Duncan of Springbank: I hope I can follow up on that point about aviation. What are your views on a new Heathrow runway?

Emma Pinchbeck: Shall I do that one? Who wants to land on that one?

We do not model airport by airport when we are doing the carbon budget advice, or at least we have not done so for the seventh carbon budget advice. As it stands, the Climate Change Committee does not have a view on Heathrow. I understand that the Government might ask us as part of their consideration of that project, and if they do we will obviously produce the analysis for it. When we look at aviation, we model across the sector rather than by airport. That is as much as we can say on Heathrow at this time.

Lord Duncan of Springbank: I will make my declarations, which I should have done at the beginning, but did not, so forgive me. I am the president of the Association for Decentralised Energy, the chair of Confor, and I advise Terrestrial Energy, an SMR outfit.

The reason I am touching on that as a beginning to the question is the assumption you make that there will be a slowing down in growth—that aviation will continue to grow, but that growth will slow—but it seems that the government policy of another runway would be the very way of encouraging growth not to slow in that context.

Emma Pinchbeck: Would you like to do how demand refers to the model, James, because it was fun?

Dr James Richardson: The way that we looked at it was by taking the starting principle that the industry should be responsible for meeting the costs of decarbonising aviation, and that that can be done through a mix of actions by the industry itself—for example, sustainable aviation fuel and greater efficiency of planes, and paying the costs of engineered removals, such as direct air capture. We then put a proxy for the cost of that. The cost was very uncertain, but we added the Government's carbon value as if it were a cost into the price of flying, and that brings you the demand pathway that you see in our modelling. We are saying that, if the industry is responsible for meeting the costs of getting itself to net zero, that will have an effect on demand and will suppress demand. If I was an investor, as a consideration it would be entirely fair to say, "Do I want to invest in the cost of expanding an airport?" You would want to know what the government policy is on who meets the costs of decarbonising aviation, but we have assumed that they are met by the industry.

Lord Duncan of Springbank: I suppose the other part is that the immediate consequence of this is that it will stop poorer people flying. The reduction of demand could be caused by a complete change in the profile of who takes a flight, which would then be quite an imposition on a whole swathe of society.

Emma Pinchbeck: James will tell you about what it looks like in the numbers. Something that came out of the citizens assembly as a point on luxury was that the advice that we have constructed is aimed at preserving the annual family holiday, particularly for lower-income households. What we have done for the first time in the seventh carbon budget is some distribution impact analysis across wealthier and poorer

households. Because wealthier households tend to fly multiple times a year, they carry more of the cost for this than poorer households.[8] There is a difference in the costs that accrue to long-haul flights, which tend to be taken by wealthier households, and what we have in our heads as the annual family holiday[9] to somewhere sunny, in Spain.

I have small children, so I completely understand the need for people to go away somewhere sunny every year, if they would like to. We have tried to preserve that in the advice, and that is part of the reason we have done it.[10]The citizens panel went further on aviation than we have done. There was appetite among the public to go further on demand management than we have advised. As James said, we have gone for a market-based approach because they said the polluter should pay, and that gets you an impact on demand. It is also the way that we could see of balancing the need[11] to still allow people to take their annual family holiday, particularly lower-income households who fly less.[12]

Lord Duncan of Springbank: Your argument would be that there should not be any impact on lower-income households.

Emma Pinchbeck: It will depend on how the industry spreads the overall price on various tickets and routes. It is worth saying that we model across the sector.[13]

Lord Duncan of Springbank: I am only saying that because wealthy people will be unaffected. They will have to pay more, but they will be able to continue doing as they will, whereas the disproportionate impact will be felt by those who have the least.

Emma Pinchbeck: It does not necessarily come out that way in our analysis. Again, it would depend on what the market does with prices. The other thing to note—we have been talking about this in the office—is that if you are thinking about a family holiday, you have to take into consideration the other costs. The market is very good at solving some of those things. We have been keen to make sure that low-income households are prioritised in our recommendations in this way, and we are confident that those holidays will still be possible. High-income households, because they take multiple flights, are disproportionately impacted. They carry more of the weight of this.[14]

Lastly, statistically, because it is helpful, 53% of the UK public have not been on a plane in the last year, and the vast majority of emissions come from the 10% of high-income households in this country flying multiple times a year. Because it is a pricing mechanism, high-income households

[8] Note by the witness: This is because they buy more tickets.
[9] Note by the witness: short-haul flights
[10] Note by the witness: polluter pays approach
[11] Note by the witness: from the citizens' panel
[12] Note by the witness: versus an approach which only tackled demand
[13] Note by the witness: rather than by particular route, ticket, customer, or so on.
[14] Note by the witness: because they buy more tickets

are disproportionately affected versus lower-income ones. The result is to reduce those flights maybe by one, as opposed to taking flight[15] off a low-income household.

Lord Duncan of Springbank: My final point is this. If your citizens panel reflects a population, and 53% of the population do not take flights, does that suggest that 53% of your panel do not take flights, and therefore they may have a particular view on this?

Emma Pinchbeck: I can follow up in writing about exactly the make-up of the panel.

Lord Duncan of Springbank: You can see why I would say that. The challenge with a citizens panel is that it must be reflective of society as a whole. When you take advice from them, the challenge can be the interpretation of that.

Emma Pinchbeck: I do not think we went through the particular make-up of technologies in their households and so on; we did it by income spread and political belief and so on. I am very happy to follow up.

The Chair: That would be welcome. Thank you.

Emma Pinchbeck: It was done for us by Ipsos, so it was independently done by an expert company.

The Chair: I have some previous supplementaries; a short one from Lord Krebs and Earl Russell, and then we will move on to agriculture.

Lord Krebs: I will leave mine in view of the shortage of time.

The Chair: Okay. Earl Russell, can your question wait or be fitted into another of the upcoming questions?

Earl Russell: It can wait.

The Chair: Okay, excellent.

Q8 **Lord Trees:** My question is about agriculture. It is very straightforward. What do you see as the main challenges and opportunities for addressing greenhouse gas emissions in the agriculture sector?

Emma Pinchbeck: There has been a significant change in approach in the seventh carbon budget for how we have done land use and agriculture, which I am very excited about and trying to make many more people excited about. The analysis team looked at sources of emissions from land, largely livestock farming, farming and agriculture, against potential solutions coming from the land, and by that I mean some of the nature-based solutions we have talked about—peatland and trees—and netted them off against one another.

[15] Note by the witness: an annual flight

To give you a sense of where the emissions come from, in agriculture just over 60% of the emissions come from livestock farming, and then there are emissions from land use change, impacts on the soil from farming, from on-site machinery and other farming practices, although that is a much smaller percentage. The solutions for that are made available by freeing the land from farming livestock to doing things like peatland restoration, tree planting, some on-site renewables, and bioenergy crops, which are also in our pathway, all produced domestically. For the remaining emissions, farm machinery and so on, it would be electrification, as you would do in other bits of the economy, some change in feedstocks and so on.

Overall, what that gives you, in conversation with the farming community, are potential revenue streams from any change in farming that is necessary to reduce livestock emissions. Should the Government get their land use framework right and the various support schemes for farmers right, we think there is potential for farming to have a net benefit from these changes rather than a loss. I come from a rural community and have a farming family, so for me that is a much better message for farmers and land managers than one where they are only identified as a problem.

Beyond 2040, the big remaining areas of emissions in the UK economy are agriculture and aviation, so they are the sectors of the economy that require, for want of a better word, offsetting functions. For aviation, as you know, in our pathway we say they should be investing in the engineered removal solutions, which are higher costs, and that offsets their remaining emissions. For the farming community, it is about nature-based solutions, on which they are in control as the people who most understand our land.

Lord Trees: Can I come back on that? There are two things. Earlier, you mentioned uncertainties, and you referred to GWP and how that is interpreted. Could you comment? If one uses GWP*, it changes the complexion hugely for productivity of meat and dairy from livestock. I declare an interest. I am a vet, and I am wearing a cow tie, but I do not own any cows. Meat is an essential food. To reduce human consumption is a behaviour change that is quite challenging. There is a risk that, if we shrink our indigenous production, which is actually quite efficient in environmental terms, we just import more, which is far less efficient. To some extent, that is how we have made progress on net zero, to be candid. Our consumption reduction is only about 20%. It is not the 50% that net zero shows. How do you respond to those two points—the GWP use and basically exporting our emissions?

Emma Pinchbeck: I will do the latter first. In the way we have done the analysis, we have maintained food security at its current levels in that we assumed that 60% of food production is domestic. Also, as James said earlier, we have considered carbon border adjustment mechanisms and things that we can do to protect industries here, and that particularly applies to farming.

On the question of dietary change, our trend line for diet starts above actual change in diet over the last few years which we think may be impacted by the cost of living. Nevertheless, there has been a story of meat reduction in people's diets over the past decade. Meat eating is about 10% down between 2020 and 2022. Before that, it was about 8% or 9%. We have started at roughly that rate of reduction and carried it forward. We have pushed it a bit beyond that to meet the needs of the carbon budgets, but not by doing anything on meat. We have instead advised Government that they should make the alternatives—vegetables, alternative proteins, and so on—cheaper, more readily available and accessible. We think that might be enough to continue the existing trend in diets. Farmers have always responded to changes in diets, as you know. That is the thing that changes our livestock calculations, which then frees up the land to do the other things we are talking about in the carbon budget. On GWP*, the question is asked a lot. The easiest thing to do might be to follow up in writing, because we have considered it. I can give you more detail.

The Chair: Yes, it is a rabbit hole that will require a lot of time. We have questions on BECCS, EVs, heat pumps and nuclear still to come and very little time. Lord Mancroft, would you like to ask your question?

Q9 **Lord Mancroft:** Yes, thank you, Chair. How technologically ready and feasible is BECCS? Does the assumed shift to domestic biomass feedstocks apply to large generators like Drax?

Emma Pinchbeck: I will do this one and I will keep it brief. Do not worry, James will do the others. On BECCS, as James said, we only model technologies at technology readiness level 6 or above. That means we have to see demonstrator projects that are working in the market. There are demonstrator projects in the UK, as well as in the US and parts of Europe, so the technology exists. It is a question of scaling it up. As James said, with all the greenhouse gas removal technologies, there is a degree of uncertainty because they are at an earlier stage of technology readiness than, for example, a heat pump. That means that in the model where we need removals technologies we have asked it to look at BECCS, and DACCS and other technologies, and we have advised Government on that as a potential uncertainty.

Yes, we assume that the shift to domestic biomass feedstocks applies to all the biomass in our pathways, including where we have BECCS on energy for waste, where we are using it for SAF, and where we are using it, for example, for a large-scale plant. The land use need of that bioenergy crop is about 3% of land, so it is not massive. The bioenergy crop is a rhizome crop, which means it has some soil improvement to it, and that helps with the emissions from the agriculture sector. We have considered that in the round.

The Chair: Why is technology readiness taking so long? What is the difficulty? On the face of it, capturing CO_2 from a chimney—it is a point source—should not be so complicated.

Dr James Richardson: These are proven technologies. BECCS has been in operation on a limited scale for many years. We know it can be done. The main issues around it, to be honest, are about cost and income stream rather than about the technology. It is a bit more complicated to capture CO_2 from a combustion process because you have a mix of gases. We know that it is feasible to do, and we know that it is feasible to store, but it needs an income stream.

The Chair: There are profits to be made in Drax and other biomass generators?

Emma Pinchbeck: As in, is this a commercially feasible technology?

The Chair: Yes.

Emma Pinchbeck: It certainly should be, in that there will be a significant offtake market for it. We have talked about two areas of the economy where we expect emissions not to reach zero and, therefore, that some kind of removals technology is necessary. We know that removals technology is necessary, internationally; it is in the IPCC pathways. There will be industries that are willing to pay for that technology, so it should be financeable and commercially viable. Technologies at technology readiness levels 6, 7 and 8 are in what investors often call the valley of death, which is where a business has taken a risk and invested in an early-stage technology, but they need it to scale to market. Often, through that valley of death, what helps is government support for a technology to scale it up, so that you get through the uncertainty about whether the technology can grow in the market. It is fair to say we have not had clarity on CCS, full stop, from government.

The Chair: Are we waiting on government action?

Emma Pinchbeck: Yes, we have said that in previous progress reports; we need business model certainty for carbon capture and storage technologies of all kinds.

The Chair: You said that a shift away from biomass imports to near zero by 2050 would be desirable. Why will it take that long to move away from imports?

Emma Pinchbeck: I will let James talk about this through the model.

Dr James Richardson: In some instances, we have imposed this as a constraint on the model to allow for the fact that there are greater concerns around the sustainability of imports. Of course, it depends a lot on where you are importing from.

The Chair: Short answer.

Dr James Richardson: In a sense, we have chosen that as the pathway. If you wanted to have a sharper pathway for that, you would have less bioenergy in your overall pathway because it is hard to free up the land

more quickly than that in the UK. You would have less bioenergy. That would give you more direct air capture.

The Chair: Thank you. Short and succinct answers would be appreciated. Colleagues have a lot of questions that they wish to put to you.

Lord Krebs: Have you commented on the merit order of biomass in relation to SAF and BECCS?

Dr James Richardson: Not really, in the sense that we think that the relative prices of those things are very uncertain. We have tended to deliberately put a mix of them into our models to reflect the fact that we do not really know what the mix will come out as, because we do not really know what the prices will be.

The Chair: Lord Krebs, would you declare your interest if relevant?

Lord Krebs: I declared it earlier, but I am happy to re-declare it.

The Chair: No, that is fine. Thank you very much. My fault.

Lord Krebs: Is the 3% of land BECCS and SAF?

Emma Pinchbeck: Yes, that covers all the biomass needs in the pathway. That should change land use.

Lord Ashcombe: You have mentioned two lots of 3% now: one for diminishing agriculture and one for this. That is 6%. That is a huge proportion of the land. CO_2 is currently being shipped to Norway to be stuck back down in the North Sea. Is that taken into account in your equations?

Emma Pinchbeck: Land use change overall is bigger than 3%. The figures that I am referring to are for particular changes in land. In aggregate, we have a land use change of about 10% for the UK overall by 2040, or, if it is easier to think of it this way, sort of in line with what the Government are saying in the land use framework. We are not that far out. The reason I am hesitant is that we model UK-wide, and then we do devolved advice. It is slightly different in each region. The land use framework is England only. Just to give you a sense, that is the figure. In relation to Norway and—

Dr James Richardson: All CO_2 storage is domestic in our pathway.

Emma Pinchbeck: We are required to model territorially under the Climate Change Act, which is important to understand.

The Chair: Thank you. I call Lord Duncan very briefly, with a very brief answer. Could you write to us on the whole series of questions that have been raised about BECCS? That would be really helpful to the committee.

Lord Duncan of Springbank: This is a question on BECCS. I am aware of the cost structure in it, which is not insignificant. In the short term, I cannot see how it could be done. I could see how it might be done at the

point when people are desperate to offset, when you need to pay in literally to buy the offset, but in the short to medium term the costs associated with it are almost prohibitive and presumably only available for Drax at the scale Drax performs, but not available to others at a lower scale. Would that be fair?

Emma Pinchbeck: It is fair to say that the business model for these technologies needs some thought. The committee's limits are in offering the Government advice for what is the most effective thing for the economy overall. The exact business models and the rollout on the ground is the job of Government, working with the private sector. As James said, we consider some of that in our feasibility requirement under the Climate Change Act. The business model for some of these technologies is complicated for the reason that you suggest, plus there are different players in a market. The offtake might be aviation, and the investor in the technology would likely be from the energy sector or from the waste sector. Our advice is that the business model needs some thought. Government is likely to have to invest in some of these technologies up front for wider industrial or other reasons. Lastly, no, we are not just talking about large scale; we are talking about the CCS on energy from waste in this pathway, for example.

The Chair: Thank you. Please send us written evidence to fill in the gaps that I know colleagues feel we still have on this. We have a question on nuclear now from Lord Jay.

Q10 **Lord Jay of Ewelme:** Thank you, Chair. I declare an interest: I used to be on the main board of EDF in Paris.

I have seen the proposed generation mix in the balanced pathway. Hinkley Point has been very delayed but is now expected to come on stream reasonably soon. The latest projections I saw for Sizewell C looked, to me, pretty optimistic. Then we have small nuclear reactors. Could you say a bit about what you see—I am talking about new nuclear—as relevant to those three? Then I have one other question.

Emma Pinchbeck: I will take a bit of this and then James. The pathway to 2040 has about 7.2 gigawatts of nuclear, up from about 5.7 gigawatts today, all new build but recognising that a lot of the fleet would retire. It is important to note that when we did the analysis we had not had the statement from Government on the intention to do life extension, which may help with some of the issues that you are describing on delay. The pathway that we have done for Hinkley aligns with the latest statement from EDF, and working with it about when we anticipate that project coming on, which is 2030. Thereafter, we have modelled significant uncertainty both in the nuclear mix—we are not saying whether it is large plant or SMRs—and more broadly. Wherever there is uncertainty, the Government need to think about contingencies. If they are concerned about the delivery of nuclear, we would encourage them to think about extra flexible generation interconnectors and so on. We have done modelling runs that look at those things, so it is possible. James, is there anything to add technically?

Dr James Richardson: We have Hinkley C and EDF's latest statement; the first unit is coming on in 2030. We have Sizewell C, but we are less optimistic on the timing of that. Then we have one additional unit, which could be one large Hinkley/Sizewell unit, or it could be a number of small units. We do not take a view on which of those would be preferable or would be chosen.

Lord Jay of Ewelme: I have one question on costs. I noticed that the Nuclear Industry Association has rather criticised the costs of your analysis in the seventh carbon budget. What is your reaction to that?

Dr James Richardson: In a sense, if they can deliver it cheaper, no one would be more delighted than us.

Emma Pinchbeck: That is what I was going to say. Whenever industry tells us our costs are wrong and it can go faster, that is brilliant. That is fine with us.

Lord Jay of Ewelme: You are sceptical that they will come up with a lower price than the one that you have envisaged.

Dr James Richardson: We have based it on the evidence, and the evidence does not demonstrate the cost of an SMR because there are no SMRs to cost. We are not using speculation on it, but, as I say, we wish them well.

Emma Pinchbeck: There is an extremely high threshold for the data that we use in our assessments. It is worth saying that.

Lord Jay of Ewelme: Thank you.

The Chair: Earl Russell, a short question and hopefully a short answer.

Q11 **Earl Russell:** It is a very short question on SMR technology. The Government announced recently a plan for AI and AI technology. I am assuming that that plan is not in this pathway.

Emma Pinchbeck: There is an increase in energy demand in the pathway over what you would need for energy-intensive industries located in the UK like SAF and DACCS. There is also room for additional energy-intensive industries to be here. We have not modelled AI specifically, but, as James said, it is highly uncertain how much will be here. There is room in the pathway for additional energy demand.

Q12 **Lord Mancroft:** We talked about electric vehicles earlier. Now we come back to them again. The rollout of charging points is not as good as it should be and we wanted it to be. The cost of electric cars is not really coming down. Although there is, as you say, production of cars in Europe, the market is still dominated by the Chinese. I am not quite sure why we should be assisting their industry. We have range problems, too. That is improving, but not much. Putting all that into the picture, what aspects of the rollout of electric cars do you have the greatest confidence in? On the other side of the coin, where do you see more uncertainty?

Dr James Richardson: I do not think I would have started from quite the position that you did. We have a lot of confidence in this because we are seeing significant falls in the cost of the vehicles. We have seen significant increases in range. A new electric vehicle will typically do 200 to 300 miles. Most people drive about 20 miles a day. We are seeing about a 30% annual average growth rate in charge points—an exponential growth in charge points. More and more vehicles are coming in from more and more manufacturers. It is certainly true that the Chinese had a head start. Partly driven by the ZEV mandate, which we think has been a very successful policy, other manufacturers are stepping up, and the number of new models coming in and models coming in at lower price points is pretty impressive. We ended last year with a fifth of all sales. We will get new figures from March soon, but this year we have been ahead of that. We are confident that falling prices will drive demand.

What I would be more worried about would be charge points in more rural areas. If you look at any infrastructure in the UK—broadband and mobile in recent decades, electricity in the 1950s, water in the 1930s—you get the challenges of pushing networks out into rural areas. The solution is nearly always the same, which is that the Government step in to help. It is a potential challenge for some parts of the network. The other issue is making sure that we upgrade the electricity distribution network fast enough that there is capacity to put charging hubs on to the system. It is particularly an issue for electric vans and HGVs where you have a concentrated electricity demand. To be fair, the Government, the industry, Ofgem and the system operator are all pushing at making that happen, but it needs to get delivered.

Lord Mancroft: It needs to accelerate more. We are not going to get to the targets that we have set out, are we, if we go at the present rate?

Dr James Richardson: We think we can deliver those targets. Again, if you look at the pathway in countries that are further ahead than we are, it is all deliverable, but, yes, it requires that we do not get gummed up in the planning system if you want to install a charging hub.

Lord Mancroft: What about batteries? There is not enough lithium around, and it is extremely difficult to dispose of.

Dr James Richardson: There is no shortage of lithium globally. Indeed, we are now looking at mining it in Cornwall. Lithium is pretty abundant in the earth. You can easily produce these things. They are also highly recyclable. They are valuable commodities. When the battery comes off end of life in the car, by the way, it still has a considerable potential life in a static world. You can put it on the grid or in people's homes for many more years and get service of it, but at the end of its life—

The Chair: Is that technology with us and scalable?

Dr James Richardson: Yes. It is already available. Some homes have former Nissan Leaf batteries, which are some of the oldest batteries out there, in the home battery.

The Chair: Vehicle to grid and grid to vehicle is—

Dr James Richardson: That is also scalable. When the car reaches end of life, you would not want the battery on a mobile thing where it is not plugged in permanently, but as a grid-connected battery you can still use it for many years beyond that. They are recyclable. Recycling plants are getting built. The flow of batteries into them is still relatively low because that is the end of life of a vehicle and its subsequent life, so it is many years after the sale. The batteries contain valuable materials that will be recycled from them.

The Chair: Thank you. We are at time, and we still have one question remaining—a very important question on heat pumps. Will you be able to stay with us for a few extra minutes?

Dr James Richardson: Yes, certainly.

The Chair: Thank you very much.

Q13 **The Earl of Leicester:** On the EV function, there is little talk now of hybrid cars, and yet hybrid cars have a range of 20 or 30 miles on electric. We have just heard that the average journey is 20 miles. Do you view it as a shame that they are not part of the solution and they are to be outlawed in 2035 because they have an internal combustion engine? They probably save at least half of energy costs. Electric vehicles are not a solution for HGVs. As I understand it, a 34-tonne lorry would need a 12-tonne battery. What about hydrogen?

Dr James Richardson: Hybrids are on their way out. They have played a role. We find that the emissions in real-world use from hybrids are not very different from those from internal combustion engines.

The Earl of Leicester: Because people cannot be bothered to charge them.

Emma Pinchbeck: You just make your internal combustion vehicles slightly more efficient rather than making a big dent in emissions reduction.

Dr James Richardson: We do not really see that having a role in the pathway. Fundamentally, the electric vehicle is the better technology. It is much more efficient, it is cheaper to maintain, and it is cheaper to drive, so it will be the winner. That is very clear now.

In terms of HGVs, we think that you will see batteries winning over the HGV market. It will be gradual. It will move into the heavier vehicles. We are starting to see what I would think of as a truck, if you do not mind the slightly non-technical term, electrifying. For the very heaviest vehicles, there are still only very limited models on the market. It is not

impossible. There are some vehicles out there. As the unit costs of the batteries come down and lighter batteries and faster-charging batteries come into the market, we are confident there.

We think that hydrogen may still play a role in off-road vehicles. For some of the very heaviest, such as a combine harvester, you may find that the battery technology does not catch up. So much innovation money will go into the battery vehicle that it is likely in the end that batteries will win out in all these markets. Hydrogen is an expensive choice. It is expensive to make, it is difficult to distribute, and it is highly inefficient compared to an electric option, so it is unlikely to have more than a niche role, if any, in transport.

Lord Duncan of Springbank: I have a very quick question. We have talked about trucks and how we will do that going forward, but in a lot of industries other vehicles are quite niche. As the chair of Confor, I note that almost all off-road vehicles are a challenge. The Government removed the red diesel discount, but in no way provided any timeline for when those vehicles would be converted. The earliest, in discussions we have had, was between 15 and 20 years before they could move in that direction, because no one is innovating in such a very modest sector. Would that chime with your experience?

Emma Pinchbeck: I would be interested in speaking more about that outside the committee, with your other hat on. As James said, just in terms of the model in the seventh carbon budget advice and beyond, for these unusual applications we are assuming a mix of technologies because we simply do not know yet what the market will be able to deliver. It is those sorts of vehicles where you could see a role for things that are not just electricity and a battery, and where it may be an alternative fuel of some kind. The fact that we are still saying there could be a mix of technologies tells you that we need more innovation, investment and government thinking in that space. They are in our pathway for 2040, so we are assuming that they will be decarbonised on that kind of timetable.

Dr James Richardson: There is innovation in parts of the market; JCB is looking at diggers. It may not be all the parts that you are in, but it is certainly not nothing.

Emma Pinchbeck: We did lots of work with our colleagues at the NFU, and there is lots of thinking about agricultural machinery going on. There are ideas out there, as you say.

Lord Duncan of Springbank: That is helpful, thank you.

Q14 **The Chair:** A quick question from me about modal shift. Your modelling and views on modal shift are more optimistic than those of the OEP. Can you talk about that a bit and about your relationship with the OEP? I am afraid I have to ask you to be quick on those as well.

Emma Pinchbeck: We have a memorandum of understanding with the OEP, which is a contractual way of saying we work quite closely with it,

and we try to respect each other's space. We are looking at similar questions from a different point of view, so there will be some differences in our outcomes. We are slightly less ambitious on modal shift than we were in the sixth carbon budget, I think. Are you going to tell me I am wrong, James?

Dr James Richardson: That is probably right. We have underpinned it with evidence looking at the places that have the highest non-car modes. One of the things that we discovered from that, which slightly affected our overall position, is that you tend to get places that have high public transport or high so-called active travel—walking and cycling—but not both. There is some trade-off between those. We have looked at what it would look like if the UK moved towards the very best. It is slightly different between cities and rural areas, but it is based as far as we can on evidence of what has really been delivered.

The Chair: Why do you need a 7% modal shift if take-up of electric vehicles is going to be dramatic?

Dr James Richardson: It benefits in the short term particularly, before the whole fleet has converted to electric. Even if take-up of new cars changes dramatically, as we project, the average lifetime of a car is about 14 years, so as you work through the stock you still have a significant number of petrol and diesel cars in the stock into the 2030s. Modal shift helps you over that period.

Q15 **Lord Ashcombe:** I am looking at both electric cars and heat pumps, and this is more about heat pumps. I am very sceptical about both. I am not a convert yet, and I am not going to be any time soon either unless something dramatic happens. In your view, what are the key reasons why take-up of heat pumps in households is lower in the UK than many other countries? Which of these issues can be most easily addressed by the Government to reverse that trend?

Dr James Richardson: By far the most important point is the economics of it: the cost to the household. If you look across countries, the ratio of gas to electricity—in some countries, oil is the alternative fuel for heating—is the single strongest determinant of take-up. In countries where electricity is relatively cheap, you see a lot of heat pumps. In countries where it is relatively expensive like the UK, you see fewer. That is the most important factor. It is something that the Government have a lot of leverage on because of the levies that we have talked about already. If you took action on levies, which is a policy choice and is something in the Government's gift, you could take action relatively quickly and change the price. You could ensure that people face the real cost of electricity, not an artificial cost. We think that would have a strong effect, based on evidence from other similar countries on take-up.

There are two other things. First, for new-build properties we need to see an end to connections to the gas grid. That is so that those properties do not all need to be expensively retrofitted later, which obviously would be a huge waste of money. It also helps build the supply chain, which

creates a guaranteed source of demand and incentives for people to trade—

Lord Ashcombe: And there is the issue: it is expensive to retrofit. The majority of houses in this country are heated on some form of hydrocarbon. It is the price of the retrofit. It is not just the heat pump. It is changing, as I understand it, every radiator and everything else that you have there. That is a massive cost for some households.

Dr James Richardson: It varies a lot between homes depending on the set-up of the home. We model all of that in our costs, as you say. The cost of the heat pump is not that much more than the cost of the boiler. It is a one-off cost, and that is important. It adds up to a lot of the overall cost of our pathway. I am not pretending otherwise. Of course, once you have done it, once you have converted your property, you do not have to convert it every subsequent time. We have converted most of our properties in this country from coal—if your property has a chimney in it—to gas. In fact, for those of you who have very old properties, they were converted from wood to coal, typically in the Elizabethan era.

Lord Ashcombe: I converted my property 15 years ago properly, and now I am being asked to do it again. I am by no means the minority who have done that.

Emma Pinchbeck: I am in the process of getting a heat pump in a complicated property. I want to add two things to what James said. First, technologies have improved, and, as James said, we are not trying to sugarcoat the fact that there is a retrofit cost in the analysis. You can see that. It is there. As James said, it includes things like radiator upgrades and pipework.

What has changed from the sixth carbon budget is that these technologies have improved because they are at scale in other markets, so they have become more efficient. Some of the upgrades were about the heat pump being less efficient, so you needed a very efficient heating system so that it stacked up. Because heat pumps are more efficient, we are having to do fewer upgrades, and that is bringing the cost down. The first thing is that there has been significant technology innovation.

Secondly, most importantly, we are not asking people to replace their heating system until end of life. When your presumably new boiler conks out, that is the time when you would be expected to put a heat pump in. If you have already retrofitted your house for it to be efficient for a boiler running on a low-flow temperature, it is probably fine for a heat pump. You are one of the people who is paying the cost of the box. In my case, I have just bought a house from the 1970s that has not been touched since then, so the costs are higher for me, and I have to do it now because my boiler is on its last legs. But the operating costs[16] will be significant for me. In my case—I do not mind saying this—because it was related to a new house purchase, we borrowed a bit more on the

[16] Note by the witness: savings

mortgage, which has been pretty efficient for us, because we have to upgrade the entire house. It is worth doing, and doing once, as James says.

Dr James Richardson: Property values are higher for homes with heat pumps in them.

Emma Pinchbeck: I will be saving money once we have done it. I would have to do it anyway because my boiler is solid fuel, unbelievably. The capital costs are there. The problem for Government is where you target support and to which households. Again, we have done a distributed impact analysis. You can see that in low-income and high-income households and various technology mixes. That might speak to the policy mechanisms that Government might adopt.

The financing for this will be a mix of private and public. If you can make electricity cheap, I promise you from my last job that there are energy suppliers looking to help with things like low-cost loans for people, because they see the ability to offer tariffs and services and things that we have not modelled, which exist, if you have an electrified home and a heat pump. The electricity cost piece is also preventing some private sector innovation around the financing for the capital cost, which, as we said, exists.

Dr James Richardson: If you can do this in France, the Netherlands or Ireland, you can do it here.

The Chair: There are two further supplementaries, and then we will bring this session to an end and let you go home.

Q16 **The Earl of Leicester:** Ms Pinchbeck, I hope you do not get a horrible surprise in a year or two years' time when you look back at your electricity costs. In our housing stock, we have put in 10 heat pumps, two on new build and, granted, that works well. The heat pump for 100 or 200 year-old properties has to be much larger and therefore much more expensive. I have two employees now who, luckily for them, insisted on having wood stoves because the electricity cost from their heat pumps was ridiculous. It was £4,000 a year.

On the national scale, your committee says that by 2040, which is in only 15 years' time, we need to have half of UK homes fitted with electric heat pumps. That is 17 million households. How many households have a heat pump at the moment? Some 300,000. Last year was the best year that British people have been fitting heat pumps—50,000 a year. If we extrapolate that, it is 340 years before we get to half the households. It is pie-in-the-sky stuff at the moment.

Emma Pinchbeck: I will let James talk you through the S-curve analysis we have done. Just on your example, another barrier that we have not highlighted, which I think is a fair one to highlight, is that you need skilled installers. You need an installer who can properly size you a heat pump and advise you how to make your house the right level of efficiency that gives you a decent cost-benefit analysis. For the installer market in

this country, these are new technologies, and as with other technology rollouts we are at a stage when we get some examples where heat pumps have been oversized or they are not efficient. What we point to is that in markets where the technology is established the technologies are efficient and they save people money.

At the moment, a lot of the installs that have gone ahead are in properties where people have the capital to do it. I live in one of those areas. I am one of those people. A lot of the people I know locally who have installed heat pumps are also installing them in larger, trickier properties, and therefore they are more expensive to do at the moment. In the analysis we have done, we assume that they roll out in typical households. Most households in the UK are not that. In most households in the UK, you are talking about post-1970s housing stock, which is pretty efficient already, where you can put in a heat pump with much less intervention and where installers will be able to do it more efficiently even at this stage. It is worth saying that. James, do you want to take the S-curve?

Dr James Richardson: Extrapolating in a straight line is the wrong way to think about this. We know how these technology rollouts look. We have had lots of technologies over the decades. You see an S-curve, as it is known, a more exponential process, which sadly all became rather familiar to us all through the Covid pandemic. What matters is the compound growth rate. We assume a 40% compound growth rate, based on evidence from other European countries such as France and the Netherlands. If you look at the UK over the last five or six years, we are at about a 30% compound growth rate. It is an acceleration of that, and we are quite clear about the policies that need to be put in place to make that acceleration happen, but it is not completely off the scale of what has actually happened in the UK. Because you always start at a very low level—the first personal computer or the first mobile phone—it looks like the process is very slow and then suddenly it is very fast. That is what we expect to see, and it is what we are seeing in other very comparable countries. That is part of the reason why we are confident in it, as well as what we have seen with all technologies, essentially, over time. We are confident that this pathway is deliverable, but it requires policy action. It will not happen without that.

The Earl of Leicester: You are confident that 16,700,000 households will have heat pumps in by 2040.

Dr James Richardson: If the right policies are put in place. It is dependent on policies. Between now and 2040, virtually every boiler in the country will be replaced. We are saying that half of those need to be replaced by a heat pump.

Q17 **Earl Russell:** Just a tiny question to end from me. You talk about the right policies. Are some of those right policies that are still missing and needed from Government better financial products coming to market, such as green mortgages and options for people in rented accommodation so that they can meet some of the up-front costs and

spread them over time so that they can afford to get over the bump of the transition?

Emma Pinchbeck: Yes, absolutely. I was going to add to the previous answer that I encourage you all to look at the distributed impact analysis that we have done for this carbon budget. We modelled 12[17] different types of house, including rural detached property or terraced houses, the typical household in this country, and that gives you some sense of the different financing needs for those properties, as well as the kinds of people who live in them and income, technology mix and so on. That speaks to a need for various financing options.

I am fortunate that I have been able to do it at the point of a house move and think about mortgage financing. That is one option—green mortgages and so on. Other financial tools are low-interest loans. I have mentioned that cheap electricity would enable the private sector to think about this as a product offering, in return for some kind of tariff in the energy sector. There are equivalents to that from the installer world where you might get a 0% interest loan. For households that are genuinely unable to afford the capital costs, that is when you have government grants: James mentioned the boiler upgrade scheme.

There is a portfolio of options, public and private. For private sector financing to come forward at scale, yes, there are various other instruments, including mortgages, but that is also part of the reason why we are banging the drum for cheap electricity. It helps business to monetise the savings and finance the capital costs. We will not see those models come forward at scale until we have cheap electricity, because you cannot monetise the savings.

The Earl of Leicester: For that cheap electricity, at the moment what you are proposing is robbing Peter to pay Paul; taking the extra costs away from electricity and sticking them on gas.

Emma Pinchbeck: No, we are not recommending that. In our advice, we simply say, "Move the levies". I pointed to it earlier, but there are various options for where you put those levies, whether on gas or on taxation or a mix of both. That is for Government to decide. There are lots of versions of that analysis in the environment at the moment.

The Earl of Leicester: But is not the levy—

The Chair: It is a question for debate for Government, and we will have an opportunity to do that.

Emma Pinchbeck: Ultimately, tax and spend decisions are for Government. If you are talking about that sort of move, that is something it will need to decide.

The Chair: Thank you. We are comprehensively out of time. Thank you both very much for your generosity with your time. I apologise for being

[17] Note by witness:15 households

20 minutes over. It is a reflection of the interest, obviously, of committee members in the issues that we have raised. We look forward to receiving the written evidence as promised by you, and thank you very much for doing that. We look forward to receiving the assessment of the UK climate risk report that you are working on so hard at the moment. It will be very useful in informing our adaptation response, which is sorely needed. With that, I bring the public session to a close.