OFFICIAL REPORT
AITHISG OIFIGEIL

Environment, Climate Change and Land Reform Committee

Tuesday 28 May 2019

Session 5

The Scottish Parliament
Pàrlamaid na h-Alba

Tuesday 28 May 2019

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ENVIRONMENT, CLIMATE CHANGE AND LAND REFORM COMMITTEE
18th Meeting 2019, Session 5

CONVENER

*Gillian Martin (Aberdeenshire East) (SNP)

DEPUTY CONVENER

*John Scott (Ayr) (Con)

COMMITTEE MEMBERS

*Claudia Beamish (South Scotland) (Lab)
Finlay Carson (Galloway and West Dumfries) (Con)
*Angus MacDonald (Falkirk East) (SNP)
*Mark Ruskell (Mid Scotland and Fife) (Green)
*Stewart Stevenson (Banffshire and Buchan Coast) (SNP)

*attended

THE FOLLOWING ALSO PARTICIPATED:

Professor Colin Campbell (Scottish Environment, Food and Agriculture Research Institutes)
Dr Diana Casey (Mineral Products Association)
Jim Densham (Scottish Environment LINK)
Dr Rachel Howell (University of Edinburgh)
Professor Tahseen Jafry (Centre for Climate Justice)
Elizabeth Leighton (Existing Homes Alliance Scotland)
Angus McCrone (BloombergNEF)
Andy McDonald (Scottish Enterprise)
Andrew Midgley (NFU Scotland)
Clive Mitchell (Scottish Natural Heritage)
Jess Pepper (Transform Scotland)
Professor David Reay (University of Edinburgh)
Margaret Simpson (Freight Transport Association)
Professor Jim Skea (Just Transition Commission)
Morag Watson (Scottish Renewables)
Will Webster (Oil & Gas UK)
Ben Wilson (Scottish Catholic International Aid Fund)
Dr Mark Winskel (ClimateXChange)

CLERK TO THE COMMITTEE

Lynn Tullis

LOCATION

The Robert Burns Room (CR1)

Scottish Parliament

Environment, Climate Change and Land Reform Committee

Tuesday 28 May 2019

[The Convener opened the meeting at 09:04]

Climate Change (Emissions Reduction Targets) (Scotland) Bill: Stage 2

The Convener (Gillian Martin): Welcome to the 18th meeting in 2019 of the Environment, Climate Change and Land Reform Committee. I remind everyone to switch off their mobile phones, as they may affect the broadcasting system. Broadcasting will organise the microphones, so there is no need to press any buttons. You should simply speak, and broadcasting will deal with it.

Under agenda item 1, the committee will take further evidence on the Climate Change (Emissions Reduction Targets) (Scotland) Bill at stage 2. Since the committee reported on the bill at stage 1, we have received responses from the Scottish Government, the Committee on Climate Change has published its updated advice, and the Cabinet Secretary for Environment, Climate Change and Land Reform has made a statement in Parliament in which the Scottish Government's response to the global climate emergency was outlined.

Ahead of considering amendments at stage 2, we have heard from the Committee on Climate Change and the cabinet secretary. This morning, we will hear from stakeholders on the updated advice to the Scottish Government.

I am delighted to welcome everyone to our first round-table session this morning. We will focus on broad issues and impacts, and on what the new advice and the Scottish Government's acceptance of it mean for Scotland and the action that we will take.

We have an hour and a half with the witnesses. Before we explore their views, I invite everyone around the table to introduce themselves. I am the convener of the committee.

Professor Tahseen Jafry (Centre for Climate Justice): I direct the centre for climate justice at Glasgow Caledonian University.

Angus MacDonald (Falkirk East) (SNP): I am the MSP for Falkirk East.

Ben Wilson (Scottish Catholic International Aid Fund): I am a policy officer at the Scottish Catholic International Aid Fund.

Stewart Stevenson (Banffshire and Buchan Coast) (SNP): I am Stewart Stevenson MSP. We are amending the act that resulted from the bill that I introduced in 2009.

Professor David Reay (University of Edinburgh): I am professor of carbon management at the University of Edinburgh.

Dr Mark Winskel (ClimateXChange): I am a senior lecturer at the University of Edinburgh and policy director of ClimateXChange.

The Convener: The clerking team is to my left.

John Scott (Ayr) (Con): I am the MSP for Ayr.

Professor Jim Skea (Just Transition Commission): I am chair of the just transition commission.

Dr Rachel Howell (University of Edinburgh): I am a lecturer in sustainable development at the University of Edinburgh.

Claudia Beamish (South Scotland) (Lab): I am a South Scotland MSP and the shadow cabinet secretary for environment, climate change and land reform.

Jim Densham (Scottish Environment LINK): I work for RSPB Scotland and I am representing Scottish Environment LINK.

Clive Mitchell (Scottish Natural Heritage): I am an outcome manager for people and nature at Scottish Natural Heritage.

Mark Ruskell (Mid Scotland and Fife) (Green): I am an MSP for Mid Scotland and Fife.

The Convener: To start us off, I will ask a broad question—it is the million dollar question. We know where we need to go, and we have been told the targets that there are pathways to get to. How do we get there?

Professor Skea: I have had the chance to go through the whole of the CCC report, which is quite challenging. It is very good at providing a snapshot of what a net zero world would look like, but it says very little about the pathway to get there. Obviously, from the point of view of the just transition commission, we need to explore that in more depth, because the pathway from here to net zero will be the big challenge.

Scotland was invited to think about the level of ambition for the intermediate years of 2030 and 2040. The CCC came up with some numbers to expand the ambition and reduce emissions by 70 per cent, rather than by 66 per cent, by 2030, but the report does not contain a lot of detailed, bottom-up analysis to take us from 66 to 70 per

cent reductions. It is very much a case of drawing a straight line from where we are now to the net zero point.

A lot of work has to be done in Scotland on the revised climate change plan, and dialogue will be needed with the just transition commission to sort that out. How we get there is the million dollar question, and we really need to start to work on it. However, the CCC has given us the start of the thought on that.

Professor Jafry: We know the road map ahead, and ambitious targets have been set before us. We have a really good understanding of the technology and the knowledge that we need to put in place to get there. We really need to focus on societal and behavioural change, and we need to engage with the public. Public engagement is critical to achieving a low-carbon economy. No matter what the ethnic minority, inequality or social justice aspects are, it is absolutely critical that we engage with the public across all sectors of society, and considering education is an absolute must. It is vital that we look at the broad set of educational and public engagement messages that need to get through.

Dr Winskel: The CCC has made a point of demonstrating that the feasibility and affordability of meeting the net zero target by 2050 is very much the end point. A lot of bottom-up analysis has worked its way into the CCC's report. The analysis was done on a bottom-up, rather than a top-down, basis, and there is some discussion about that in the report.

I agree with Jim Skea that there needs to be a lot more analysis, in Scotland as well as in the United Kingdom, on the detail of the interim targets. The CCC has been fairly open about that. It has done what it was asked to do, which was to demonstrate the feasibility and affordability of meeting the net zero target by 2045 in Scotland and by 2050 in the UK. I do not think that the CCC sees its report as the finished job.

ClimateXChange will also be very keen to work with and across Government on filling out the evidence base, which we have already been doing in the time that we have had.

Jim Densham: In its report, the Committee on Climate Change said very clearly that Scotland can make much quicker progress than the UK can because of our wealth of land to store and sequester more carbon. That is really encouraging and shows the importance of nature-based solutions in helping us to achieve the targets, so we need to put in place such solutions very soon. That is important not only for tackling climate change but for protecting nature and solving the multiple problems that we have in relation to biodiversity loss.

The CCC's report talks about afforestation, which we have known about for a long time. It also mentions the importance of peatland restoration, and we have a great opportunity to do that work in Scotland. The report touches on other things, but we can do much more. The CCC has said that meeting the targets is feasible with today's technologies, but we will know a lot more quite soon if we put in more effort.

For example, we are looking at the value of blue carbon. Scottish Natural Heritage has put lots of work into calculating the huge stores of carbon in our marine environment. We must protect that block of storage, but we can also recreate coastal habitats to store a lot more carbon. A Royal Society for the Protection of Birds report from a couple of years ago called "Glorious Mud: homes for nature, protection for people" looked at the potential for coastal realignment. We could realign up to 4,000 hectares of coast right now, which would mean that we could store huge amounts of carbon in coastal areas. Such things are not included in the report, but they could have been. There are many more technologies that we will know more about if we put more money and effort into research.

Professor Reay: I completely agree with Professor Jafry's point about needing to bring everyone with us in order to meet the targets, which will be difficult, because the 2045 target that the Committee on Climate Change has laid out is really stretching. At the moment, there is real public support for what the Scottish Government has done in accepting the advice and going for the 2045 target. There is great will, but there is a real risk of losing it, and Jim Skea's just transition commission is key to avoiding that.

The Committee on Climate Change's report highlighted that we do not yet have the skills base across all sectors in our society to meet the target, so we need to build that capacity. There is a real role for further and higher education at all levels in providing the skills base to allow us to make the transition. That applies to jobs and will mean that we can deliver across all areas, from the expertise that is needed for peatland restoration, as Jim Densham described, to developing zero-carbon housing. As ever, investing in people is how we will meet the target.

Dr Howell: I stress that we will get to where we want to go only if we start work immediately. We have a really interesting task because, in one sense, it is a long-term project—a marathon—but we need to go out of the blocks as though it is a 100m or 200m sprint. Whatever date is set for reaching net zero, we need to understand that we haven't got 30 years to start, we must start now.

Like Professor Jafry and David Reay, I think that public engagement, which is my area of expertise,

is very important. In addition to education, there are other ways that we can work collaboratively with civil society organisations to overcome the barriers to public engagement and behavioural change, such as through actions that increase a sense of agency and self-efficacy. I am happy to explore that further and make some suggestions.

The Convener: I am happy for you to do that right now. It seems to me that public engagement might attract the people who are already completely aware of the actions that they might take, but how do we reach the harder-to-reach people whose lives are going to be affected?

09:15

Dr Howell: We are at a really exciting place on engagement, because the polls show a higher level of concern about climate change than there has been for many years. The proportion of people who are aware and engaged is much higher than it has been, and that will be helping to change social norms. The hardest-to-reach people will come along, in part, once things become more normal. One of the most important aspects is that we make doing things in a sustainable way the most normal, cheapest or easiest thing to do.

Media attention on climate change is the highest that it has been since the Paris agreement in 2015. For example, one aspect that I have written about in my response relates to the dietary changes that we need—from a health perspective as well as a climate change one. There are lots of barriers to people adopting more sustainable behaviour, some of which are financial or practical—for example if someone does not have a bus service, they cannot commute by bus—and some of which are more psychological. Those include the barriers to dietary change. A lot of people say, "I am willing to make changes to my diet or cut down flying, if I can see that others are doing that too. There is no point in me doing it on my own."

We could work with groups in society that are pushing for greater changes, such as extinction rebellion and Friends of the Earth, to set up commitment platforms. Through those platforms, their members and supporters could create agreements that say, "I will commit to doing this"—there could be different levels of commitment—"if this many people also commit to it". That is how we could overcome some of the agency and psychological issues and give the civil society organisations that are pushing us to do more a role to play in engaging their members. That could be a relatively low-cost approach.

Obviously, there are other barriers that will need policy and infrastructural change. It is extremely important that you, the policy makers, are not asking individuals to commit to behavioural changes where the barriers are such that they cannot remove them. Engaging organisations could be a useful contribution. For example, whatever target is chosen for going net zero, extinction rebellion will say that it is not enough. However, I would want to go back to them and say, "Okay, get your members to commit. If you can do more than the net zero report expects society to do, we can do more."

The Convener: That would be a focus on asking people to contribute practical actions rather than just campaigning.

Dr Howell: That is what people want now. They want to know what they can actually do themselves.

Clive Mitchell: We have a triple challenge in how we get there. As Jim Skea has already indicated, the net zero report makes it quite clear that we cannot get there without taking into account land use change and forestry emissions. Over the timescale for achieving the 2040 target, there will be at least another 0.5°C of warming from the inertia resulting from previous emissions. Therefore, the trends and changes that we have seen in terms of droughts, floods, pests and disease will intensify and get a bit worse over the same period, and we will have to adapt at the same time as we take action to reduce emissions going into the atmosphere.

Since we cannot put a spade in the ground without affecting adaptation, mitigation and the state of nature, we need to address issues to do with the loss of biodiversity at the same time as we move to a net zero economy through—as others have said—a just transition.

On collaboration, it is worth reflecting on what we have been able to do on the basis of an organisation-by-organisation, sector-by-sector approach over the past ten years. That has achieved reductions in emissions of 3 or 4 per cent a year, which is impressive and has been great to see. However, we need to more than double that reduction from 2020 onwards to get on to a net zero pathway. As others have said, the key to that lies in collaborative place-based approaches to create communities of interest and peer groups that people can identify and move with to address mitigation, adaptation, the state of nature and the associated United Nations sustainable development goals all at the same time.

The Convener: A couple of members want to ask questions. Stewart Stevenson had his hand in the air first.

Stewart Stevenson: I have listened with interest so far. It seems to me that the contributions have fallen into two groups. The

larger one is about controlling emissions, which Rachel Howell and Tahseen Jafry focused on. Jim Skea and Clive Mitchell have talked more about sequestration and mitigation. Of course, we are not looking for zero emissions; we are looking for net zero. The Committee on Climate Change report focused much more on emissions and rather less on sequestration, and I wonder whether there is more to do on that. Sequestration is one of those apparently free lunches. If we could do it all by sequestration and not have to change behaviours, that would be lovely, except that there are other reasons for changing behaviours besides those that we are dealing with.

I wonder how those two issues play off against each other. We have specialists in emissions management and changing behaviours and specialists in sequestration. How can policy makers in Government help to focus the people with the specialisms to deliver the maximum in their area without necessarily being distracted by what other specialists do in other areas? It is about trying to break the generality of the problem into the specific contributions that each of us can make in our scientific and professional lives. How do we do that as policy makers?

The Convener: I saw Mark Winskel nodding at that.

Dr Winskel: That is a great question. I work for a body called ClimateXChange, which is one of a number of centres of expertise that are funded by the Scottish Government. ClimateXChange deals with adaptation and mitigation, so we think about that quite a lot. It is a business of bringing together different specialists in a collaborative environment. Stewart Stevenson talked about the policy challenge, but that is mirrored by a research challenge in bringing together the different disciplines and expertise to think about the issue as a whole-economy problem. It is absolutely clear that it has to become a whole-economy challenge, throughout all the layers of Government.

There is an equivalent challenge for us as researchers because a number of experts are involved, and it is difficult for researchers and specialists to bring their work together. Real attention needs to be given to how Government funds research and how we go forward together. We need to think about how we do the analytical job. A lot of attention has been given to the Scottish TIMES model, which we will talk about, but that is just one way of thinking about the whole-economy challenge.

I want to come back to one point. There is a bit of a danger that the net zero report implies that achieving targets is more about behaviour and less about technology, because it talks about "known technologies". It is slightly dangerous for research and policy when the Committee on Climate Change talks about "known technologies". That refers to technologies that in many cases and in some of the more difficult-to-treat sectors are far too expensive to be adopted at scale. Innovation is about demonstrating things. At the moment, the options for decarbonising heat look much more expensive than our current ways of supplying heat to lots of buildings in Scotland and elsewhere. Even building efficiency needs a lot of technological innovation. The Committee on Climate Change looked at the issue, and it suggested—I would not rely on these figures—that technological solutions are about 40 per cent, behaviour change is about 10 per cent and the rest is a combination of both. That is a very broad-brush picture, but it shows that we cannot take our eye off the technological challenge. I know that that is difficult, because some of the technical challenges, such as carbon capture and storage, require a lot of international work. However, the Scottish Government must be careful not to take its eye off that and must think about infrastructure spend appropriately, so that there is good alignment between the available infrastructure spend in Scotland and the climate change plan.

The Convener: There is also a massive role for the UK Government, for example in the decarbonisation of the gas network. That brings me back to the point about our not having had a response from the UK Government. That response will be key, will it not?

Dr Winskel: Absolutely. We are expecting heat strategies next year from both the UK and Scottish Governments, and the strategies will have to be aligned.

My point was that quite a lot of infrastructure spend is happening in Scotland; we have the Infrastructure Commission for Scotland and infrastructure programmes, and significant amounts of money can be leveraged, with UK money. However, activity must be directed appropriately, so that we can find out more about how we secure the costs of low-carbon heat, hydrogen and CCS. Scotland has an opportunity to attract UK funding by leveraging its own spend in those key areas.

Professor Skea: I will follow Mark Winskel's point by taking a systems view. We should recall how the thinking in the Intergovernmental Panel on Climate Change's report, "Global Warming of 1.5°C", in which I was involved, has moved into the Committee on Climate Change's report. The message is very much that, because of the level of ambition that we are looking at, nothing can be left off the table. We cannot say, "It's either behaviour or carbon dioxide removal"; the ambition is such that we need everything.

To support Scotland's current target of 90 per cent greenhouse gas reduction by 2050, there was

a scenario entitled, “Ambition”. The net zero report has a scenario entitled, “Further Ambition”, which gets us to 96 per cent, and a scenario entitled, “Speculative”, which is about what is needed to get to 100 per cent. The CCC is signalling that nothing can be left off the table.

My view on all that is that “or” is probably the most overused word in this debate. It is about “and”, “and” and “and”, when we are talking about different measures.

I want to pick up on the points about behaviour, which I entirely agree with, and Clive Mitchell’s point about nature-based solutions and I will flag up another point. In its report, the CCC talks about bioenergy with carbon capture and storage, which is a very difficult issue; it also talks about direct air capture of carbon, which it suggests could be located with bioenergy with carbon capture and storage, to take advantage of economies of scale. As I understand it, one of the reasons why the CCC argued that Scotland could be more ambitious than other parts of the UK was to do with our greater access to those technologies and approaches in Scotland.

I am not commenting on the feasibility of such approaches. The just transition commission is specifically asked not to talk about the ambition—that is not our job; our job is to think about how we get there and fairness. However, it is worth recalling that what differentiates Scotland from other parts of the UK is the potential for greater access to carbon dioxide removal. We need to keep that in mind.

Professor Jafry: I will return to the question. I completely get the need for different mindsets to come together and brainstorm where we are at. Policy makers should not assume that they have all the solutions. A classic example is that we have researchers working on green infrastructure in some of the poorest parts of Glasgow, but the communities in those areas do not want green infrastructure and do not want trees planted on their doorsteps. Policy makers are sitting round the table wondering why not, given that planting trees is the most obvious solution, but when we look further into the matter, we find that people are saying that it is to do with security, particularly for women and children. People say, “Parklands are not lit”, “It is unsafe to go out”, “It encourages alcohol and drug abuse”, and so on. Such issues are beginning to come to the fore, and the people who are sitting round the table had no idea that they would come up. We must not assume that we have the solutions. The need to co-design and co-develop solutions with communities is therefore critical.

On the point about technology, we must not underestimate the value of small-scale and low-cost solutions. They can have a significant impact in encouraging behavioural change and on how we deal with bringing down emissions for our climate. There is a lot of merit in that approach, rather than always going for high-end, high-cost technology development. There is a place for that, but we must not underestimate the value of the small-scale solutions.

09:30

Clive Mitchell: To answer Stewart Stevenson’s question directly, we do not have enough planet to do all of it by carbon sequestration. We would probably need about three planets to do it that way, so the bulk of the effort has to be on reducing the emissions that go into the atmosphere in the first place. It is also clear that we need to use land carefully to close down the carbon cycles that we have exploded, particularly over the past few decades.

Other nutrient and geochemical cycles around nitrogen are also key. Peatland restoration is really good for keeping carbon in the ground and sequestering it from the atmosphere. It also helps to regulate water flows, reduce flood risk and so on. Blue carbon would be another example. Things such as kelp beds are good for sequestering carbon and they also dampen wave energy and reduce coastal flood risk during storms. I re-emphasise the point that it is about both adaptation and mitigation—the state of nature all together.

My final point is about technologies, recognising that they are important and reinforcing all the points that have been made around the table. Technologies inevitably drive behaviour change and it is important to recognise that, particularly when we are talking about large-scale technological interventions. We need to think carefully about what kind of behaviours will be stimulated as a result of those technological interventions and how they are compatible with net zero and addressing UN sustainable development goals.

Professor Reay: I will go back to Stewart Stevenson’s question about expertise. I made a point earlier about needing more skills and capacity, which we do, but we also have a wealth of expertise in Scotland. The Committee on Climate Change said that we are ahead in terms of both our emissions reductions and our capacity to deliver more. Part of that is the expertise that we have in academia and in our practitioners, from our farmers through to the oil and gas sector.

We are a good way along the line in terms of expertise, but there is a danger of silo mentality. My specialism is agriculture and land use, but if I look at only that and do not talk to Jim Skea, for instance, there is a danger of unintended

consequences. We need to do everything—as Jim Skea laid out, it is "and," "and" and "and"—but that must include looking at the system and at unintended consequences. Some of the mistakes that we have made in the past, particularly in terms of the afforestation of peatland for other objectives, were made in a context that did not take account of the whole system. There are dangers if we rely on siloed experts.

Dr Howell: We can couple sequestration and mitigation. It would be useful to do so in certain sectors where behavioural change has so far been hard to achieve and there are fewer technological solutions, at least in the near term. The obvious example is flying. We can directly link extra charges on those kinds of behaviours and say that the charges are necessary because, in order to achieve net zero emissions, we must sequester the carbon—although in a public forum it would be more useful to frame it as "the pollution". We would say that we were asking people to pay extra as a fair measure to help to reduce the pollution through planting trees or whatever.

We should link the two issues rather than play them off against each other, although the committee will have noticed from my submission that I think it is important not to frame it as an offset. Once people believe that their behaviour can be entirely offset, they might be encouraged to feel that they can fly more. The framing will need to be something like, "reduce the effects of your pollution", rather than saying that it will offset it or using terms such as carbon sequestration and so on that do not resonate so much with the public. We need to make it about pollution.

The Convener: That would also require ring fencing whatever revenue came from that activity.

Dr Howell: Yes, that is what I suggest would probably be necessary for certain sectors, and it could be useful in encouraging more positive views of that. That said, research from Germany shows that people lack trust in whether the money is actually being ring fenced, so there would have to be real transparency in that respect.

The Convener: Okay. I think that John Scott has a question.

John Scott: It is just a very brief one on Rachel Howell's point about taking people with us. You have said that the polls are very much in favour of tackling climate change, but I point out that one of the hard-to-reach groups is the elderly. The fact is that people are living longer and longer, and behavioural change is much harder to deliver for elderly people. Speaking as someone who might be the oldest person in the room—

Stewart Stevenson: No, John—it is me.

John Scott: Perhaps not completely the oldest, then.

In any case, I know from my experience of dealing with my parents and others that people just do not want to change as they get older. I am therefore disappointed by Mark Winskel's comment that only 10 per cent of the solution to this problem will be behavioural change, while 40 per cent of it will be, as it were, technology. I had rather hoped that behavioural change would make up more of the solution, and that takes us to the issue of modal shift. How are we going to deliver that? After all, public transport seems to have been overlooked in much of our discussion.

Dr Winskel: I should point out that what you have cited is not my analysis, but the analysis of the Committee on Climate Change. What one might derive from that figure, which I agree is disappointing, is that either we are hugely underestimating the potential of behavioural change or that such change is a lot more difficult to put into practice for all kinds of social and political reasons.

The other 50 per cent of the solution will come from what is termed behavioural and technological change working in combination. I do not disagree with anyone on this—indeed, I very much agree with Jim Skea that this is a matter of "and" rather than "or"—but there are challenges to deal with. One of my other jobs is with the UK Energy Research Centre, and we have done some survey work with UK-based energy experts and stakeholders on where they think decarbonisation will come from in different sectors. As far as transport was concerned, the vast majority of people thought that the electrification of vehicle stock was going to be the huge route to decarbonising individual consumer transport stock—in other words, private vehicles.

There were very mixed views from the experts on the contribution of modal shift, with lots of them, including transport experts, saying that it is going to be hugely important and others very sceptical about its role. Often the reasons for such a view is that it is, in political and policy terms, quite difficult to force behavioural change in all sections of the population, not just those at the leading edge. I understand your point about the elderly. I am not an expert in this area, but I think that one will have to look at the evidence.

The CCC also carried out some really good analysis of the policies to date that have proved effective with regard to transition, and it is a really nice mix of carrots and sticks. For example, it has discussed the role of subsidies in providing learning with regard to expensive technologies; indeed, one of the reasons why offshore wind is now a lot cheaper is that subsidies have provided lots of learning. Moreover, they have also led to

competition among producers, and the auction system that we use in the UK has proved to be really successful. The committee suggests that an expansion of 70GW in offshore wind—which is massive—is necessary, and it would double the electricity system.

Other contributors include taxes such as landfill tax as well as getting emissions out of waste, which is something that has been hugely important in Scotland. Another aspect is regulating things out when a next-stage technology can be brought in—such as bringing in condensing boilers and not allowing conventional boilers to be built or installed any more. Just those three measures have made huge strides and prevented massive amounts of CO_2 from being emitted.

Mark Ruskell: I have a technical question about the decisions that we need to make on interim targets in the bill because of the need for action in the next 10 years. The Committee on Climate Change's report provided analysis on how we view peatlands in the inventory—whether they are relatively carbon neutral or a habitat that could make a significant contribution to reducing carbon emissions that was more than we had expected. How that is viewed can change the assumptions about the target that we should put in place. The CCC's advice is that targets should be based on a revised inventory rather than the inventory to which the bill relates, or that, if they are based on the current inventory, they should be higher than those that the CCC initially recommended. What are the witnesses' views on that?

Separately, a number of submissions have mentioned blue carbon, which relates to wetlands, kelp forests—the convener knows that I am a big fan of them—and a range of other habitats. We do not know much about whether such habitats are sucking up or releasing carbon. What do people think about how blue carbon will be treated? Will we have to revise all the inventories again if we suddenly find out that our oceans are emitting far more or sequestering far more than we thought?

I apologise for raising two technical questions, but they are important, because they relate to the decisions that we need to make about the 2030 target and other targets and about the amendments that the bill needs, if any.

Professor Reay: Both questions are great—I love technical questions. We need to go with the advice about including peatland emissions, which will mean a substantial uplift in the Scottish account, because only a quarter of our peatlands are undamaged or have been restored. We should take the hit now to set a baseline that allows us to show action.

In Scotland, peatlands are a net source of CO_2. Under the Committee on Climate Change's 2045 target, peatlands will remain a source of emissions, but the emissions will be much smaller, because of restoration. Such an approach is honest about how the atmosphere sees CO_2, which is the key. Our accounting is all well and good, but the issue is what the contribution to warming is.

Peatlands need to be in the inventory. Our science has come on in leaps and bounds on how well we can monitor, report on and verify emissions and on how mitigation action can change emissions.

There will be revisions to national greenhouse gas reporting because of changes in global warming potential factors and things such as blue carbon, but that should not stop this committee and the Parliament acting on advice. Blue carbon might well be a larger sink than we think or it might be a source, as Mark Ruskell suggested, but that should not prevent action on the advice as it stands. The research base in Scotland is strong, and a lot of us are focusing our attention on quantifying blue carbon, so that we can get to the stage that we are at with peatlands, when we can ask whether we can include it in the inventory and how we can manage it better.

09:45

Clive Mitchell: I echo what Dave Reay said. Measuring emissions from land-based sources will always be more difficult than measuring those from a pipe, because one is the land and the other is a pipe. Emissions in land-based settings will depend on the context in which they sit in different parts of the country. It will be difficult to draw a hard and fast rule that applies everywhere in the country. As Dave Reay said, the need to restore peatland is clear. If we do not do so, it contributes more and more carbon to the atmosphere, and the atmosphere does not worry about how we account for these things. Restoring peatland is essential.

We are still working through the inventory to find out how much blue carbon there is and where it is. Sediment sources will probably be the largest, particularly in the fjords and lochs of the west coast. We need to understand better the consequences for how we manage inshore waters and the associated stocks of blue carbon, and the way that inshore waters not only store carbon but—as I said about kelp forests—reduce wave impact during storms. Measuring that will probably be cruder than for pipe-based emissions.

We need to see the land and sea as insurance. There is stuff that we need to do to keep greenhouse gases where they should be in the ground or in the sea, but we need to focus our efforts on reducing the emissions from the fossil fuel sources that we are burning.

Dr Howell: I want to speak to the interim targets part of Mark Ruskell's question. The inclusion of peatlands is important, but the new inventory means—presumably unintentionally—that the interim target of 70 per cent is lower, and we cannot go backwards on commitments. The CCC states that the interim target using the current inventory method equates to a reduction of 76 per cent by 2030. The equivalent targets for the minimum necessary should therefore be 76 per cent by 2030, and 96 per cent by 2040. The advice that Professor Kevin Anderson produced a few months ago about what Scotland can do equated roughly to 86 per cent by 2030.

The interim targets need to be more ambitious than those currently proposed. There is no scientific rationale whatsoever for the proposed targets—they are just a straight line. I understand why the CCC had to do that—it did not have time to do more—but that is not evidence-based policy making. I would have thought that the Government would be slightly embarrassed to say that it had set targets on the basis of how a ruler fits on a graph.

As we discussed, more ambitious interim targets are also necessary if we are to get out of the blocks fast. If the target that is enshrined in the bill is net zero by 2045, that needs to be seen as a starting point. I hope to see whoever announces that to the media making a commitment that the target will be revised as we see how it works out, with the intention of bringing forward the net zero date if progress is faster than expected.

Professor Skea: When an inventory methodology is revised, that affects not just the emissions in the current year but the emissions in the base year. Scotland moving towards percentage reductions makes the reductions more robust against inventory changes than would otherwise be the case.

On the prospect of future inventory changes, I had the misfortune to be at the approval session for the latest version of the IPCC's inventory guidance about three weeks ago—it was painful indeed. To give an example of the kind of changes that might be seen, the new guidance includes how to deal with emissions from flooded land. That would have a direct implication for Scotland if Scotland ever wanted to do hydroelectric development, as any creation of new surface waters would have implications for the inventory. That kind of thing coming through in the future would expand the inventory's scope.

I hate to say this, but there is an almost theological debate about what is natural and what is anthropogenic. A lot of the ocean stuff is essentially seen as natural, not anthropogenic, and would not fall within the scope of the inventory, at least at the moment.

Jim Densham: I totally agree with Dr Rachel Howell that we need to have the strongest targets possible. Obviously, we need to include peatland restoration and be honest about the emissions that we have had since 1990 and before as soon as possible, so that we can make changes and incentivise land use change.

That is important, because the IPCC report on 1.5°C was clear that we need to keep to 1.5°C, rather than overshooting and then coming back to 1.5°C. That is important for wildlife, which is very vulnerable to temperature change. The CCC's report includes a headline that says that "every degree matters". For wildlife, however, every tenth of a degree matters, because it is so vulnerable. Although not every species acts in the same way or is as vulnerable, some species are very vulnerable. We need to go as fast as possible as soon as possible. As Dr Howell said, we need to sprint out of the blocks to make a difference.

Of course, that also goes back to Mr Stevenson's point about sequestration. We need to do as much as possible not just to mitigate CO_2 but to tackle the hard-to-do things that involve biological processes such as the generation of nitrous oxide and methane, which often come from farming. We must do as much as we can with sequestration but also reduce other things as much as we can by going for the untapped potential in farming.

I will quickly expand on that point. We should use the land use strategy to plan those interventions, so that we know which farmers can do more on sequestration and which can do more on efficiency measures, and how much dietary change can make a difference. We should then consider how we use post-common agricultural policy funding to pay farmers for public goods—not just for food production but for sequestration. That is important, because some farmers will need the support of being paid for public goods if they are to keep going with those fair policies and continue to work the land.

Ben Wilson: The interim target is important, particularly for SCIAF, which is concerned about the impacts on the global south. David Reay said that it is how the atmosphere sees emissions that is important, but we could also say that it is how the global south sees the impacts of those emissions that is important. We therefore need the best and most accurate accounting, and the strongest targets—for 2030 in particular—that are based on that best and most accurate accounting.

As a couple of colleagues have said, the point of the CCC report was to respond to the IPCC special report on 1.5°C. The IPCC report was unequivocal that we need 1.5°C if we are to protect developing countries from the greatest possible harm, and that we could reach 1.5°C in

12 years. However, the CCC's response was not clear about Scotland's fair share of the contribution towards holding to the 1.5°C temperature goal by 2030. Although it was clear about its view of what a fair share of Scotland's contribution would be by 2045—net zero—it was not clear about 2030.

We, as civil society, have been calling for the bill to set not just the targets that we need to reach but the principles that we need to follow in order to reach them. When it comes to conversations such as this one, that becomes ever more important, because this piece of legislation will direct the targets that we set up until 2045, and perhaps even further into the future. There will be changes—such as inventory changes—over the next 20 to 30 years. It is therefore crucial that we ensure now, while we have the opportunity, that the principles that we should follow to achieve the targets are explicit in the bill.

Claudia Beamish: I will briefly focus our minds on behaviour change and ask two questions. How important is the framing of arguments on climate justice and intergenerational justice for behaviour change and for taking society with us? I do not want to highlight issues to do with climate strikes.

In relation to specific regulation and the shifts that need to happen, such as modal shift, what financial or advice support do witnesses see as appropriate, particularly for individuals on low incomes and communities in which a lot of people are on low incomes?

The Convener: I have a question that fits neatly with Claudia Beamish's question. I am conscious of the interesting Dutch statistics; the Dutch invest €35 per person per year in cycling infrastructure, but the health benefits of that investment, and the longer-term impact on health spend, are worth €19 billion a year. How do we communicate the fact that that kind of short-term investment translates into long-term savings, not just economically but in terms of wellbeing? Who would like to give their thoughts on and tackle that?

Professor Jafry: That is a really good question. It is important that we frame the argument not only in terms of climate justice, but in terms of injustice and the impact that climate change will have on the poorest and most vulnerable people. Financial support is important. The International Development Committee of the House of Commons published a report on aid spend across the UK Government's programmes. The report recommended that use of a climate justice framework would help in examining that spend. We are not looking at international development spend, but at a different pot of money.

We must also ensure that there is financial support to enable the poorest and most vulnerable people to adapt, because they do not have the capacity and ability to adapt as readily as others might be able to: some people can put solar panels on their roofs, but others cannot. We need to look carefully at our expectations for our communities and society, because we cannot expect everyone to adapt—there are limits to people's ability to do so.

To go back to health benefits, I suggest that it is important that we communicate the broader message. That relates to John Scott's point about elderly people. All those things are packaged together. Various questions come to mind. What has this got to do with me? Why do we need to change? What is in it for us? It is a problem that is seen as happening elsewhere; many people in Scotland do not really connect with the effects of the changing climate, so we need to think hard about how we communicate the message.

There was, I think it was last week, an interesting thing in the news. At the British Academy of Film and Television Arts awards, there was an announcement that the industry needs to consider embedding climate change messages in documentaries, the storylines of soap operas and other programmes in order to help people to connect with what is happening. We have to find an inroad to that so that we do not end up with bottlenecks. We need to develop that conversation and engage people, and we must not assume that we have the answers. Many such things are happening.

On the health benefits, I think that I mentioned the last time I was here that the World Health Organization had published at the start of the year information on 10 threats to global health. The WHO highlights climate change as the number 1 issue that will affect people's health. If we address climate change, that will have benefits for our health. Turning negative messaging into positive messaging might be what engages society. People are generally fed up with negative messaging.

The Convener: They are overwhelmed with it, too.

Professor Jafry: They are overwhelmed. The Centre for Climate Justice has a programme of work on mental health and climate change injustice. There are real issues to do with eco-anxiety: people worry about the impact that climate change will have on them, personally. We see that in the extinction rebellion protests, and in children missing school in order to protest. People are very worried about what is happening. We need somehow to turn that on its head and say that the Scottish Parliament will deal with the issue so that our society does not need to worry about the future. It is a huge conversation, and I am not sure that we have time in the committee to take

that forward. There is a lot that needs to be unpacked.

10:00

Professor Reay: I would echo the comments to the effect that there are many positives in addressing climate change, including in relation to human health outcomes and cleaner water and air. I work increasingly with the land use and agriculture community: there are a lot of positives for it in the UK Committee on Climate Change's report about negative-net-cost emissions reductions, particularly through nitrogen management.

However, most of us who have neighbours who are farmers, or who have farmed ourselves, know that agricultural extension services are not perfect throughout Scotland. The change that we need will require high quality in that provision and huge uptake of it, so what should we do? We talked earlier about how individuals want to know what to do about climate change: that is even more true for a lot of farmers. If the expectation is that they will grow trees, they might not have the appropriate expertise and there might be cultural and historical barriers to their doing it, so giving them a lot of assistance will be key.

In addition, not all the people who live on and manage our land are landowners. Policies that could deliver carbon sequestration could put at risk the livelihood of tenant farmers and push them out of where they live.

There are many positives, but we really need to get information about agricultural extension services out to everyone in all sectors and not just to the land-use sector.

Professor Skea: I will make two points on behaviour. The first is on links between health and climate change mitigation. It is often said that we make behavioural interventions that are climate mitigation measures that have health co-benefits. My question is whether they could be portrayed the other way around—as health measures that have climate mitigation co-benefits. For example, in trying to make changes to people's diet, or to make their transport modes more active, including by walking and cycling, the basic message would be that it prolongs active life and benefits people and their families, and that in doing it everyone contributes to the collective good. I defer to Professor Jafry and Dr Howell on that, but it seems to me that how you frame the message might affect behaviour a lot.

Secondly, I will wind back to the question about why the CCC report refers to only 10 per cent of change coming from behaviour. I am no longer a member of that committee, but I have a history with it. I recall the committee having a certain culture—it wants its work to be evidence based and quantitative. It is much harder to gather quantitative evidence on behaviour change; such evidence is often qualitative.

When we have behavioural interventions, it is incredibly important to do ex post evaluation properly, in order to understand what made the difference and why one intervention has been better than another. Obviously, climate targets are framed quantitatively, but behavioural evidence is qualitative. Anything that we could do to bridge that gap would help us a lot.

Dr Howell: Jim Skea is absolutely right to say that it would be helpful to frame some measures as being primarily about health, with secondary climate change benefits. For example, one policy that could be brought in that would help with dietary change could be to ensure that public institutions, such as hospitals, prisons and long-stay institutions, offer far more meat-free options, and that at some meal times there is no meat-based option. There is a very clear health reason for doing that, especially in hospitals, and there is a duty of care to prisoners in terms of ensuring that they have a healthy diet. That would more understandable, and possibly more publicly acceptable, than telling people that we will place responsibility for carbon reduction on prisoners who do not have a choice, rather than on people in their homes.

On Claudia Beamish's question, framing the arguments in terms of climate justice is, indeed, very important, but unfortunately the matter is a little complicated. It requires our speaking to people's values—but different people have different values. An organisation called Climate Outreach has done a lot of really good work on how to frame arguments for different parts of the political spectrum. It has been found that framing the arguments in terms of climate or environmental justice might work very well for people on the centre-left or the left, but it does not work well for those at the other end of the spectrum or even on the centre-right. The organisation has done a lot of work on framing them for that latter group. The issue is complicated somewhat by the need for different kinds of messages for different audiences.

That does not mean that we tell people different truths; it is about using language that speaks to different people in different ways. I wish that I could remember specific examples off the top of my head; however, I do remember that for people on the political right, the arguments have been framed in terms of, for example, tradition, responsibility and measures to protect our natural heritage. Such arguments resonate more with them. If the committee is interested, or if Claudia

Beamish personally would find it useful, I can provide links to those reports after the meeting.

On support that is appropriate for different sectors of society, particularly with regard to finances or advice, I will talk about people who are on low incomes, who were mentioned earlier, and I will come back to the point that was made about elderly people. One important thing that we should recognise is that, in general, there is a strong positive correlation between income and carbon emissions: emissions are lower among poorer people. The good news, therefore, is that a lot of the behaviour change that we need will have to come from people who can afford financially to make it.

However, we will also need to target advice and support at the behaviour changes that will benefit the poorest people. The fact is that there is a lot of variation between income deciles. People in the lower deciles who have high carbon footprints have them primarily because they live in hard-to-heat homes that, in general, they do not own. Policies and support will therefore need to target landlords, social and private, to ensure that their tenants can live in well-heated homes and can lower their carbon emissions.

The carbon footprint of people who are the real elderly, rather than people who are recently retired, is often a bit smaller than that of others, because they are not so mobile and do not tend to take as many flights, particularly international ones. Behaviour change might be more difficult for elderly people in respect of their diet and their living in large homes. Advice and support might be needed to encourage—not, I should say, force—them to consider not just downsizing, but installing and using smart heating systems, and to recognise that, if they want to keep their large home with lots of bedrooms so that their children and grandchildren can visit and stay, there is no need to keep it all heated all year round when the extra bedrooms are empty.

It will therefore be very important to look at particular sectors and behaviours, but the really good news is that we can focus our attention first on people who are more able to make changes, because they are often better off and better educated. It is all about making this sort of thing more normal, cheaper and easier.

Dr Winskel: I agree with what has been said, but I think that it is important that we do not bracket behaviour off from spend on infrastructure and innovation. I might have introduced that approach, so I have not been paying attention to my own advice.

In respect of, say, cycling or heating, what makes low-carbon options attractive is often the infrastructure that people see when they look out their window, and the options that are available to them. We have to understand that, if we are interested in modal shift in transport, infrastructure spend is highly relevant to that. We should therefore look at the low-carbon infrastructure transition programme and other infrastructure spend that is available to see how much of it can be directed towards encouraging modal shift. I do not know what the figures are at the moment: it would be interesting to take stock of how spend is being directed.

The same applies to heat: we have to make affordable options more available over time, but that is difficult at the moment, as is well understood in research. The Committee on Climate Change has therefore introduced the recommendation that no new homes be connected to the gas grid after 2025. That is okay for new homes, but they are a very small proportion of the overall building stock. We have to move to a stage at which we will, over time, be able to regulate out what is by far the most popular way of heating buildings. That cannot be done easily or quickly. If we try to do it easily or quickly, we will cause problems through people—the elderly and the vulnerable, for example—being put in disadvantageous situations. Getting the message right on those things is important.

Regulating things out often works very well when it is made less visible to people. In respect of natural replacement of boilers, for example, boilers have become more efficient over time because the less efficient technologies have been regulated out. Therefore, there is not a less efficient option for the consumer. There is a question about how active to make choices at household level versus smart regulation by Governments and regulators. A lot of good behaviour change happens because of the latter.

Ben Wilson: SCIAF and other organisations have called for climate justice principles to be put in the bill. The conversation that we are having demonstrates the need for that. We need to be clear about how we will apply the provisions of the bill through policies: we have all agreed that that presents great challenges, but it also presents great opportunities. Through the national performance framework, which is underpinned by the United Nations' sustainable development goals, there are already structures to evaluate changes and ensure that they are achieved correctly. However, they need to be underpinned by climate justice.

I gather that there was some debate in previous evidence sessions about the question of principles being included in the bill. I highlight the need for the principles to be in the bill in order to ensure that we enact it in the proper way. The principles that we are calling for are informed by Mary

Robinson's principles of climate justice, which relate to human rights, gender, intergenerational justice—which Claudia Beamish touched on—and the right to development. Fundamentally, if we do not act on the climate crisis—acting on it is why we are here—we will undermine the right of other people in the world to access their basic human rights and development. That is what the Paris agreement is about, and the Paris agreement is the reason why we are all here.

Clive Mitchell: As witnesses around the table have said throughout the meeting, framing of the arguments is massively important. That goes back to the earlier discussion about collaboration. It is vital that we consider who is in the room talking about the problems and finding solutions to them: I emphasise the importance of involving young people in making decisions, as well as involving people from the other societies who are affected by the decisions that we take.

On quantification of costs and benefits, we have—although it is debatable—quite good methods to assess aggregate costs and benefits of decisions. However, most of the issues to do with the state of the climate and nature lie with distribution of those costs and benefits across people and societies, and they are about who wins and who loses. We probably need to develop much better tools to evaluate distribution of costs and benefits in order to inform a just transition to a net zero economy.

John Scott: I declare an interest as a farmer.

I want to go back to Jim Densham's point about land use. What are the witnesses' views on my idea of developing a single new climate change mitigation land class, by essentially lumping into one thing peat bogs, forestry and other potentially valuable assets for climate change mitigation, and presenting that as a positive thing for land users and managers? They might then target external funding to support climate change mitigation. The witnesses should be brief on that question.

10:15

Jim Densham: It is important that we carry on recognising opportunities and educating people. We must tell farmers, and support them to understand, what their land has to offer in carbon sequestration, be that through agroforestry, which is more about integration—growing food as well as planting trees—restoration of peatland or, if they are on the coast, coastal restoration.

I say that we do not need to classify land separately; it is more about recognition. That goes back to my point about the land use strategy: it is important to take an integrated approach. We want to avoid what we have done in the past, which has been to say that some land is really good for arable farming, some is good for upland beef and other land is good for housing, for example, and then to extend that in order to identify land that is good for sequestration. We need to take a much more integrated approach; we need farmers to realise that if they are not in area A they can still do something. There is lots to do in terms of mitigation that is not necessarily about carbon storage and sequestration.

A land use strategy that is used and works, and which takes a regional approach, could really help organisations and farmers in a region to drill down into what is important and to establish what is the priority in that area. In the flow country, for example, peatland restoration will be massive. In some areas there will be opportunities for tree planting, and others might be really good for agroforestry. We could then direct appropriate support, advice and funding to those areas. We already have a land use strategy, but it should be used much better.

Clive Mitchell: I very much agree with Jim Densham. I would, reflecting on the zonation that has occurred through the planning system since the 1950s, be cautious about introducing zonation in a crude way into how we use the land. Planning has been done around use of the car: planning for housing, retail and industrial use has made it very difficult to get about towns and cities in anything other than a car. If we want people to be more active in their daily lifestyles—walking from A to B, and so on—we need to think carefully about the granularity of different types of land use within a given space. That applies equally to whether we use the land for farming, forestry, nature, food production and so on, in order to derive multiple benefits at a scale that can address adaptation, mitigation, the state of nature and the sustainable development goals.

The Convener: Stewart Stevenson had a question. That was some time ago, so I apologise.

Stewart Stevenson: I now have about six questions, but I will not ask them all.

The Convener: Let us limit it to one.

Stewart Stevenson: It is all right, although I will say that I am six years older than John Scott. I want to come back to Jim Skea, in particular, on the change in the bill from the volume of CO_2 and other gases that we are taking out to percentages. Speaking as a former minister who got hurt in political terms by changes in the inventory, which damaged the apparent progress that we were making, I wonder whether both the percentage and the inventory management approach conceal a fundamental truth, which is that the amount of CO_2 in the atmosphere has to come down. Although percentages make it easier for ministers and policy makers to explain what is going on and

what they are doing, they tend to hide the underlying reality. I wonder whether the change, which I would almost certainly support if I was the minister, is concealing that.

Just before I finish, I will say a few words about another of my six questions, if the convener does not mind.

The Convener: Okay.

Stewart Stevenson: Old people can find good things to do that will help them. Our heating bill is £700 a year less than it was, which means that we are burning 1,300 litres less oil to heat our house, simply because we went from 200mm to 600mm of insulation in the attic. There are lots of positive ways by which we can get old people on to the agenda, by looking at how to persuade people through valuable interventions that would help to get them in the mood to do more.

Professor Skea: That was a direct challenge from Stewart Stevenson, who has absolutely pinned it down. The use of percentage reductions is good for stability in the policy effort that could be needed, but the absolute quantities would probably be better for a longer-term science-based view on the amount of carbon dioxide that we can afford to put into the atmosphere.

I think that your advice from the Committee on Climate Change on how to handle inventory changes was that over the short term—maybe up to five years—you should look at compliance with targets according to the methodology that was in place when they were set, but that over a longer timescale, you should reconsider the targets in terms of science-based needs. I am struggling to remember the details, but if I have recalled correctly, that was an attempt to square the circle of the dilemma that you are right to set out.

For the convenience of policy makers, percentage reductions retain stability; I am sure that, in Stewart Stevenson's previous roles, he will have understood the potential advantages of that.

Stewart Stevenson: The advantages would be only for policy makers, not for the climate.

Professor Skea: Yes.

The Convener: We have a final question from a member, and then we will use the rest of our time to hear the views of panellists.

Claudia Beamish: I have a question, too.

The Convener: Mark Ruskell will ask his question first, but it is now not the final question.

Mark Ruskell: We have heard reflections about infrastructure and the potential to lock in behavioural pattern system changes. I seek the panellists' views on whether the bill as currently constructed deals with infrastructure with regard to budgets and assessments. The system seems to be based on the carbon emissions of the concrete that is used to build the infrastructure but not necessarily those from its future use. Could the bill be improved so that we get a more accurate picture of what will happen when we start to use what has been built?

Professor Reay: We have the ability to account for consequential analysis, so that it could include not just the embedded carbon in a new road but its consequences for potential emissions change—exactly as Mark Ruskell has articulated.

Rather than answer your question directly, I will refer to the revisions to the climate change plan and lock-in. We could say that the 4 per cent difference—between 66 and 70 per cent—would be nothing by 2030, so that surely we need to be more ambitious. However, the revised climate change plan must take into account the lock-in issues. The trajectory is from now to net zero at 2045, so the issue is not just about the 4 per cent difference; it is about decisions that will be made that could make zero by 2045 impossible, which need wider consideration than just how to make up the 4 per cent difference.

Jim Densham: We need to embed some of the knowledge and stats across the board, not just in this bill or other bills. The bill can give a steer on how to do that, and the legislation should include something to help to make that happen, particularly so that the budget would look ahead at how things can be paid for and accounted for. As Professor Reay has said, we do not want to make wrong decisions to pay for something that will increase our carbon budget in the future. An example is how we can be sure that decisions in a future agriculture bill that would include land use and how we would pay our farmers would be more climate beneficial, rather than the opposite.

Claudia Beamish: With your agreement, convener, I will ask a question and those who wish to comment can do so in their final remarks.

The Convener: That is fine.

Claudia Beamish: It is a specific question. I appreciate that the bill sets high-level targets, especially in relation to 1.5°, which we have been exploring, but it focuses our mind sharply on policies, as we have heard. Does anyone on the panel want to highlight, in a sentence or two, specific policies that they think are really significant? I will give one example on which I would appreciate a comment. Should we alter in any way our procurement policies? It is for the panel members to mention specific policies that we need to look at. Your comments might feed into the climate change plan, which will follow on from the bill.

The Convener: That is a great final question. I will go round the table and ask our guests for their direct top-line asks on policy change. Are you up for the challenge, Tahseen Jafry? What policy changes would you like in the climate change plan?

Professor Jafry: Gosh!

The Convener: I can come back to you.

Professor Jafry: My thinking about that relates to the earlier question on framing and climate justice frameworks. It may all just come together. On a practical level, I suggest the development of a climate justice framework with certain parameters, such as procedural justice, distributive justice and intergenerational justice. We need to encourage the development of such a framework and of indicators of impact and measurable change that we want. If we package all that up, it is about how that feeds into the direct policy change that we are after. I am not sure whether we are looking for policy change within the communities arm of Government, but I would like to see something that we could measure against to show that we have delivered change through a certain policy.

Ben Wilson: SCIAF is a member of the Stop Climate Chaos Scotland coalition, which collectively is calling for a nitrogen balance sheet to help us to understand and to eventually deal with agricultural emissions, as well as action on housing, with a target of all houses achieving at least energy performance certificate level C by 2030.

I will comment quickly on a couple of amendments, rather than policies. I have mentioned the climate justice principles, but the bill also requires a tightening up of some of the definitions, such as those of the terms “fair” and “safe”. At the moment, it is clear what we mean by “safe” but not very clear what the bill means by “fair”. We are calling for more equity in the bill.

Professor Reay: Agriculture is a key area in which the current climate change plan is not ambitious enough. Based on the Committee on Climate Change advice, the plan needs to be more ambitious in that area.

One thing that we have not mentioned is the rest of the world, although we have mentioned south of the border a little. As a nation, if Scotland delivers even a proportion of the reductions in the next few years, we will learn a lot of lessons and we will be a fount of information for other nations that are looking to see how they can do that as well. Next year, we have the 26th conference of the parties, which will bring the Paris agreement into force with a new ambition from all the nations. Through the sort of discussion that we are having today and discussions more widely, we have a real role to play in how other nations can decarbonise rapidly, so that we can achieve that 1.5° ambition, because we certainly cannot do so by ourselves.

Dr Winskel: My comments are probably more about the plan than the bill, I am afraid. What is exercising my mind is the period of six months that we have from royal assent to the publication of the new climate change plan. That poses a policy challenge and a challenge to us in the research community. I would like a much more joined-up approach to that so that it is a research and policy business. It will be incredibly difficult to do it in six months, although I know that work is starting now—

The Convener: It is a revised climate change plan, not a new one.

Dr Winskel: Okay. This is perhaps a more general point, then, but there are challenges in bringing together all the evidence. Today, we have heard a lot of different perspectives on the problem across the aspects of mitigation and adaptation. Bringing together the evidence is a formidable challenge for any analytical body, in Government or outside it, so we need a lot of transparency about the evidence.

10:30

A point that came up in this committee’s session with the CCC was the fact that a lot is being spent on innovation, but a lot of the investment is not finding its way into forming a public evidence base that we could use sensibly to understand how much faster we might be able to go on interim targets. That would help to address the challenges in relation to lock-in, which I agree with.

Another point is the difficulty for policy makers at different levels in thinking about the problem. Local authorities are expected to do a lot of work, particularly in relation to heating and energy efficiency, and it will be challenging to ensure that their approach, response and investment is consistent with the national approach. Again, research can help to address the issues at local, national and international levels, but bodies such as ClimateXChange acknowledge that that is challenging. We need to take a much more integrated approach and to work together.

Professor Skea: I will highlight the work of the just transition commission, because a lot of the conversation has been about communities and consumers, but we must not forget that there is a work element to the issue, too. It is important that we invest in infrastructure and in developing the new supply chains that will be needed to allow the transition to take place. We need to develop new skills and to transfer skills from industries that

might go into decline. That is core to the commission's work.

It is important that the work is joined up across different institutions in Scotland. The work of the infrastructure commission will be important, as well as that of the just transition commission. I also flag up the role of the national investment bank, as it develops. We are aware that sister national banks such as KfW in Germany invest a lot of money in the built environment, in improving energy efficiency and in building up supply chains with small and medium-sized enterprises, which is an important area to consider.

My top-line message on policy is that investment in infrastructure and skills will be important.

Dr Howell: Given that the convener wants a brief answer, I will focus on the areas in which there could be more ambition: travel and diet.

The Government needs to look at policies that ensure that people are eating healthy diets, which will also mean that they are eating more sustainable diets. I have mentioned the possibility of introducing regulation on the kind of offerings in public institutions.

My recent research has led me to read health-based papers about diet, and I have been shocked to discover how problematic it is for our health to be eating our current levels of red meat, particularly processed meat. To me, it looks as though that will be the new smoking. An extraordinary range of health conditions are affected by such consumption, so we need to pay serious attention to the problem, because it is very much a health issue as well as a climate change issue.

The National Farmers Union is right to say that it would be wrong to reduce the production of meat before demand has reduced, because that would drive imports. We need to provide messaging on diet that focuses on health and says that, if people eat more plant-based meals a week, they can afford to ensure that the meat that they buy is good quality, tasty and ethically produced. If we demonstrate that Scottish meat is really good quality and if we have regulations on Scottish production that ensure that meat is ethically produced, the transition could be a positive for Scottish farmers.

It might be interesting to talk to the Welsh Government about what it is doing on travel. It has an interesting scheme in which all long-distance buses across Wales are free to all users at weekends. There is nothing in the Welsh Government's public messaging about why it has introduced such a scheme, so it would be interesting to talk to the Government about why it has introduced it, how it is affording it and the impact that it is having.

My experience of travelling around Wales has been that there is high uptake of buses. I travelled on a route on which the operator had to put on two buses at the same time because the first bus was so full. If the buses are full of people because of modal shift, that is good news; if it is just that people are doing extra travelling, perhaps it is not good news, unless that leads to those people being more willing to take buses at other times.

Jim Densham: I was going to mention the nitrogen balance sheet. I will not say that Ben Wilson stole my point, but given that he talked about that I will talk about afforestation, which is key in the Committee on Climate Change's report.

We need to do better at understanding the mitigation potential of different trees in different situations and locations and on different soil types, and the nuances in that regard. At the moment, people tend to say, "Well, I'll plant a sitka spruce tree, and it grows fast, so it will sequester a lot of carbon." That is true in some situations, but it depends where the tree is planted. Not all trees are good in certain places.

Integrating agroforestry with food production systems will not be all about sitka spruce—it will be about other types of trees in rows and so on. We need to understand what trees are doing and how they are sucking carbon out of the atmosphere. We need to understand how to plant broad-leaf trees, as well as conifers, to be better for the climate, and we need to manage and protect our existing woodlands better.

Clive Mitchell: From everything that we have heard, it is clear to me that this is not about a single policy. It is about a whole-economy approach and better integration. It is about how grey and green infrastructure work together and how we secure investment in that regard, with the public and private sectors working together towards a zero-carbon economy.

It is about thinking carefully about who is involved in the decisions that affect them—that challenge has been mentioned. In particular, we must think about young people and the intergenerational aspects of the issue.

It is about striving for multiple benefits as we address mitigation, adaptation and the state of nature altogether, and—for any decision—it is about asking, "What does this look like in a just, net zero economy?"

The Convener: Thank you, everyone, for your time. I suspend the meeting briefly to allow for a change in panel.

10:37

Meeting suspended.

10:44

On resuming—

The Convener: We continue with today's second round-table session at stage 2 of the Climate Change (Emissions Reduction Targets) (Scotland) Bill. I welcome all those who have come along. I know that many of you will have engaged with the committee during our stage 1 consideration of the bill.

We have a good two hours to discuss the bill with those who might be termed our sectoral stakeholders. I will do the same as I did in the previous session and get those around the table to say who they are and where they are from; however, I do not think that the members need introduce themselves again.

Jess Pepper (Transform Scotland): I am from Transform Scotland, the alliance for sustainable transport, and we work to make walking, cycling and public transport affordable and accessible to everyone.

Morag Watson (Scottish Renewables): I am the director of policy for Scottish Renewables, which is the industry body for renewable energy in Scotland.

Professor Colin Campbell (Scottish Environment, Food and Agriculture Research Institutes): I represent the Scottish environment, food and agriculture research institutes, or SEFARI.

Will Webster (Oil & Gas UK): Good morning. I am from Oil & Gas UK, which represents exploration and production companies in the North Sea as well as contractors, and we have about 350 members.

Margaret Simpson (Freight Transport Association): Hello. I am from the Freight Transport Association, which represents freight and logistics companies.

Andrew Midgley (NFU Scotland): I am environment and land use policy manager at NFU Scotland.

Elizabeth Leighton (Existing Homes Alliance Scotland): I am director of the Existing Homes Alliance Scotland, which is a coalition of housing, environmental, industry and fuel poverty bodies calling for greater action to improve existing housing stock in order to address fuel poverty and climate change.

Angus McCrone (BloombergNEF): I am chief editor of BloombergNEF. We used to be called New Energy Finance, and we are a group of about 250 people within Bloomberg who research everything to do with global low-carbon transition.

Andy McDonald (Scottish Enterprise): I head up the energy and low-carbon transition team at Scottish Enterprise.

The Convener: Okay. I guess—[*Interruption*.] I apologise, Dr Casey. I got confused. On you go.

Dr Diana Casey (Mineral Products Association): No worries. I am from the Mineral Products Association, which represents cement, lime, concrete, dimension stone and silica sand activities in the UK.

The Convener: Apologies, again. It is just as well that John Scott is sitting beside me, as I always say. [*Laughter*.]

I am seeking some positive reactions to my first question. What positive things can be done in your sector to help Scotland achieve the targets that have been advised by the Committee on Climate Change? I will come to you first, Dr Casey.

Dr Casey: Sure. With regard to the materials produced by our members, a whole range of things can be done to help the situation. A lot of that was not set out in the CCC's report, so it would be good if I could get that across now.

First of all, I want to mention recarbonation. The committee's report mentioned enhanced weathering, but recarbonation, which is the process of atmospheric CO_2 being taken in by and permanently stored in cement and concrete throughout their lives, happens in our urban environments every day and, at the moment, it is not included in greenhouse gas inventories. Because it adds up to quite a significant sum, including it in the inventories would help us to reach the targets.

The cement industry has already done a significant amount of fuel switching away from fossil fuels to waste biomass fuels, which are also not mentioned in the CCC report. We feel that that is a very good use of biomass, because the cement industry's use of the material, which has already been through one cycle of use, not only contributes to energy targets but, with the recycling of any mineral content in the biomass in the cement product, aids the move to a circular economy.

Our materials are also beneficial to reaching net zero, given that heavyweight building materials provide thermal mass, which is another area that was not mentioned in the CCC report but which can significantly reduce energy consumption over the lifetime of a building. The CCC report mentions overheating in buildings, but the fact that thermal mass can help to prevent that in a passive way without requiring mechanical cooling, with which greenhouse gas emissions are associated, is not mentioned.

Jess Pepper: We welcomed the advice from the UKCCC, and it is great that the Scottish Government has responded so quickly and strongly to it. We especially welcome the Government's commitment to make structural changes across the board and to make changes on planning, procurement and financial policies, processes and assessments, all of which are important.

It is good to see good stuff in the report, but there is plenty more that we could be doing in the transport sector in Scotland, which would have lots of multiple benefits. It is great that that has been such a strong theme in today's evidence. There is a big focus on electric vehicles, which have a role to play. We would like there to be a lot more investment in active travel and the public transport system, because of all the co-benefits that that could produce for Scotland. There is a lot more positive stuff that could be done, but the Government's response is a good start.

Morag Watson: Our members are extremely welcoming of the net zero target. Meeting it will be challenging—as the report said, we are talking about possibly quadrupling the amount of electricity that we need to generate from clean sources. The renewable energy industry stands ready to help us to meet that challenge. As we have seen with the falls in the cost of onshore and offshore wind—onshore wind is now the cheapest source of electricity—with the right long-term policy environment, we can achieve Scotland's net zero target. Our members stand ready to contribute to that and to make Scotland a world leader in meeting our own energy needs from clean renewable energies.

Professor Campbell: We very much welcome the report and the opportunity that it gives us to refresh our thinking about how we do things. The Scottish environment, food and agriculture research institutes have been researching climate change and the issues around it for a long time, and we see this as a moment in time when we can think again about how we approach the subject.

The situation is quite challenging in the area of the environment, food and agriculture, where there have not been huge improvements in the past eight to 10 years. We need new ways of thinking. A huge amount of research is being done on improving the efficiency of our agriculture and food production systems, which is very aligned with the work to meet our greenhouse gas emission targets, but most of the improvements that we are talking about are incremental.

We are also doing research on how we alter our systems and develop new systems of agricultural production using agroecological principles, and that work is very aligned with the need to mitigate our greenhouse gas emissions.

However, we are conscious that we need to have even more transformative ways of doing things and to come up with new ideas about how we grow food. There are new technologies available, such as indoor vertical farming. That is a necessity because of the changing weather that we face, but it has huge benefits from the point of view of environmental footprint and saving greenhouse gas emissions. It can disrupt food supply chains and reduce food miles and food waste. Lots of other technologies are coming along. We think that it is vital that those new technologies are considered. Many of the projections in the report are about using existing technologies, but we think that there are lots of new technologies that can make a contribution in the future.

Will Webster: We saw the CCC's report as a positive blueprint as well as a big challenge to all sectors of the economy and society. It was an honest report that was frank about the costs that will be involved across the board.

From the oil and gas sector's perspective, the CCC's projections for production and consumption of oil and gas in the UK economy were fairly consistent with our projections. We see there being two timeframes, one of which runs until around 2035. As "Vision 2035" sets out, our vision is to maintain production from the North Sea during that time. By 2050, the world will look significantly different. We found it important that the CCC's report recognised the positive impact that our sector can have in supporting the energy transition.

As far as what our sector can do is concerned, the CCC's report thought that there was an on-going role for the use of gas, in particular, increasingly in decarbonised form. The necessity of rolling out carbon capture and storage was a constant theme in the report, and we recognise that that puts the oil and gas sector at the centre of the transition.

The technical report included analysis of emissions from all the major energy-using sectors. Our emissions form about 3 per cent of total UK CO_2 emissions, whereas the consumption of fossil fuels forms about 60 per cent of emissions, so the priority is to address how we use fossil fuels in the economy and not necessarily how we produce them.

There is an important question about competitiveness. If we add undue costs and requirements in our production sector, indigenous production will be replaced by imports. It is important to get the balance of what has priority right.

However, we will have incentives to reduce our emissions in the next 10 years because, like all

industrial sectors, we are covered by the EU emissions trading scheme, and we expect a version of that to go forward. That adds a lot to the costs of using CO_2, so that is an incentive. As the emissions certificate price has increased sharply and the free allocation has reduced, that has created much stronger incentives for our sector and all other industrial users. Such things will mean that our sector naturally continues to make a contribution.

Margaret Simpson: It is important to say that the FTA very much supports what the report is trying to achieve. Our members are very much doing what they can, with the introduction of the Euro 6 standards for heavy goods vehicles in 2014. Our members continue to look at alternative fuel options, but there is no definite answer, particularly for heavier goods vehicles.

The freight and logistics industry is all about efficiency; anything that reduces costs and improves efficiency can only be good for the Scottish economy. The committee should not forget that the freight and logistics industry does not exist for fun—that sounds a bit childish, but the industry is there to provide a service to everybody else, whether that is industry, business or the individual customer. There are lots of aspects to that and lots of solutions in elements of the industry to improve the situation.

Andrew Midgley: NFU Scotland welcomes the report and recognises the challenge that it presents to the agriculture industry. The target for the industry is so challenging that it marks an era-defining moment for Scottish agriculture, because of the change that will be required.

We must embrace that change, and we as an organisation have committed to doing that. We want farmers to be part of the solution and we want farmers to continue to farm. However, that often does not seem to be how things are talked about. We want people on the ground to be enabled to change and to be part of the solution.

There is lots in the report that farmers and the industry can do. The report emphasises win-wins—things that people can do that will save them money and reduce emissions—but we must equally recognise that significant dietary change and land use change present a challenge to the industry.

The positive thing that we emphasise is that we see a collective challenge. We must work with the Government because, although the industry can do lots itself—by introducing the win-wins to save itself money and reduce emissions—a lot of what is being talked about, such as infrastructure changes, will present businesses with high costs, so we must work together to work out how to do that.

As an organisation, we would like to work with the Government to move forward in such a way that the industry does not feel that emissions reductions are being done to it. We must work collectively to work out how to get to the common objective while taking the industry with us. That is the best way to get there and that is where we can help.

11:00

Elizabeth Leighton: The Existing Homes Alliance also welcomed the report and the Scottish Government's decision to accept the Committee on Climate Change's recommendations on the targets. The issue is not only what housing can do to support the reduction in emissions, but what it must do. The CCC report said clearly that we cannot meet climate objectives without major improvements in housing and specifically without near-complete decarbonisation of the housing stock. It is one of the things that is simply not an option. We cannot leave housing as it is and do transport instead—it has to be tackled.

The good news, particularly in Scotland, is that we are not at a standing start. It may be a mixing of metaphors, but we can be out of the box fast. We have good infrastructure in place, and we have the "Energy Efficient Scotland" route map. We would argue that the route map's targets need to be revisited to make sure that they are aligned with the new targets, and that they will have to be accelerated. We do, however, have an infrastructure that is working on advice and support for homeowners on energy efficiency and decarbonisation of heat.

On how the first panel of witnesses framed the argument, with housing we are definitely not talking about a sacrifice; we are talking about an improvement in people's housing with healthy, beautiful homes that are affordable to heat, warm, and comfortable. That means an improvement in people's quality of life. The CCC's housing report has 36 recommendations. Not all are specific to Scotland, but many do apply to the devolved Administrations. There is plenty to get going with on housing.

Angus McCrone: In the private sector, it is always good to have a business plan—it gives any business something to aim for and means that it might well make it; if there is no business plan, it probably will not. In that sense, it is helpful to have the long-term targets from the CCC. Reading the report, I was a bit flummoxed by the technology mix that was presented as being the future. The issue is global, and what will work are the technologies that prove themselves to be competitive on a global scale. Those are the ones that overwhelmingly will be replicated in Scotland and in the UK generally.

For instance, we are a lot more aggressive with our forecasts on future cost reductions for wind, solar and batteries than the CCC assumes. We expect EVs to form a larger percentage of the passenger and commercial car fleets and to do so more quickly than the CCC does. On the other hand, we struggle to see some of what the CCC puts forward on carbon capture and storage, unless there is a high carbon price and a technological breakthrough. CCS has been talked about for a long time but, in the 13 years in which I have been doing my present job, it has not advanced greatly. I would emphasise technologies where there is a clear path to global cost effectiveness. In some cases, that is already achieved and with more cost improvements to come.

Andy McDonald: I echo some of what Angus McCrone said. We welcome the climate change plan update and the committee's work. That will accelerate and bring focus to a number of the things that we need to deal with. The fact that the plan is cross-societal as well as cross-sectoral means that there is broad engagement, which should allow us to bring together all the excellence in Scotland, the UK and beyond to address the challenges.

As we bring to bear academic and industrial innovation—the latter is particularly in our domain—to find solutions with companies, I hope that some of them will be solutions to global challenges that can, therefore, be internationalised and traded, meaning that those services and products will be not only of economic benefit but of obvious benefit to citizens in our society.

The Convener: The committee's stage 1 report specifically tasks the enterprise agencies with having a priority of low-carbon enterprise and innovation. That would require a different mindset. Innovation is not successful 100 per cent of the time. Is Scottish Enterprise prepared to accept an amount of trial and error?

Andy McDonald: Where the risk is high, that has been our function—we share that risk as part of the operation of innovation. Yes, we are very aware that not every innovation or project will succeed—that is the challenge of being the economic development agency in that mix.

Mark Ruskell: The Confederation of British Industry Scotland's submission says that a lot of businesses are waiting to see what technologies and innovations emerge, whether they involve hydrogen, carbon capture and storage or whatever. Meanwhile, time ticks on, and it takes 10 years to make big, transformative changes. What is the best mix to stimulate that innovation and start to answer some of the questions about which technologies and big, transformative changes should be pushed? Is this about allowing markets to make decisions? Is it about the state taking a more active role through the Scottish national investment bank, for example? What would that involvement to drive innovation, with the private and public sectors working together, look like?

I am well aware that the Economy, Energy and Fair Work Committee is holding an evidence session on the Scottish National Investment Bank Bill this morning. There is a bit of a cross-over with other agendas here.

The Convener: Is your question directed to Angus McCrone?

Mark Ruskell: It is directed to anybody who is interested in innovation and technology. There is a heavy reliance on CCS and hydrogen, as well as other interests, around the table.

Elizabeth Leighton: I will respond in relation to housing. The Scottish Government has shown caution in accelerating progress on, and the standards and expectations for, improvements in existing housing. It says that the technologies are not ready and that it cannot get ahead of the market, and it is expressing concerns that we do not have the capacity or the skills in the supply chain. However, we surveyed suppliers, and the preliminary results are that 90 per cent of them think that EPC band C is achievable by 2030 rather than by 2040 and that the technologies to meet that target are available now. That is the accelerated action in the next 10 years. Suppliers say that

"we are happy with our current capabilities to meet EPC band C".

We need to realise that we are not inventing the wheel—the technology has been used widely throughout Europe, but we remain miles behind and treat every installation as if it is the first ever. I know that I am speaking just about the housing sector, but that caution is a drag on progress. The Government is not giving suppliers what they say are the key to success in delivering against the target: clarity and consistency. The Government needs to set the target and confirm that it will not change and the supply chain will deliver.

There is still plenty of room for innovation in the housing sector, but the supply chain's message about meeting the EPC band C target is clear.

Jess Pepper: I have talked about investing in our public transport system. There is a good reason for doing that: to allow a just transition and to give everybody access to better choices for their travel. We need to decarbonise our public transport system, and I will draw attention to three modes that we could look at.

This nation makes and has great expertise in buses, trains and ferries. We can afford to be

much more ambitious on buses, as I mentioned when I gave evidence to the committee previously. Buses are largely overlooked in the advice from the UK Committee on Climate Change, which seems to be a missed opportunity, because investment in buses and decarbonising is an opportunity to achieve real modal shift.

Right now, the big problem in transport—which has not shifted in 30 years—is road traffic. Therefore, investment in buses, to improve lives, efficiency and health and to tackle inequalities, is really important. We make buses, we can demonstrate leadership in bus manufacturing and we do so globally, hosting two global bus headquarters. A massive contribution could be made with some serious investment, and that connects to people commuting through everyday active travel, which reduces the risk of major diseases—among all sorts of other health benefits.

Since we last saw the committee, we have been working hard with the industry to explore exactly what the potential is for decarbonising our entire rail network, and it is good news. We have been looking specifically at Scotland, but you will see responses from across the UK, from industry and rail experts, that demonstrate that we should be aiming to decarbonise our entire rail network by 2030 and that that is entirely possible with intercity routes and rural routes, ensuring that nobody is left out and that it is an inclusive and attractive system to which everybody has access. However, given the urgency, instead of thinking about it, making plans and debating it further, we must crack on with that rolling programme now.

We have secured ourselves 10 years by making the decisions that we made 10 years ago to electrify the route between Edinburgh and Glasgow and to buy the high-speed trains that go across Scotland now. Those trains will not be around for ever, but they buy us a window of opportunity of 10 years in which to make decisions that will impact on our rolling stock choices well into the next decades and possibly beyond 2050. If we are really smart and invest in our infrastructure and rolling stock, we could be ahead of the game, which would bring transferable skills and employment opportunities in exporting that experience elsewhere. In Scotland, we have a good track record—sorry, I could not think of another word—on rail, and we need to crack on and invest in it. What a great opportunity and an attractive resource it could be.

On ferries, we need to think about lifeline services. We have three hybrid ferries. What opportunities do we have to look at investment and ambition in relation to ferries, too?

We have talked about improving lives and all the co-benefits of, for example, addressing inequalities and increasing efficiency in freight transport. It is important that we provide solutions not just for passengers but for freight. As we said in our evidence on freight, we could be shifting freight on to trains. That is absolutely what we need to be thinking about. We could improve our railways to take more freight—we have the skills and the opportunity to do so.

If we provide quality, affordable, accessible alternatives, people will be attracted to them. We see that with the new Hitachi 385 trains that run between Edinburgh and Glasgow. When people were polled, they said that they preferred them, that the new trains enhanced their journey and that they were keen to use them. So, there are real opportunities.

The Convener: Rachel Howell, who was on the previous panel, used the phrase “easy and cheap”. Where I and my constituents live, public transport is not easy, cheap or particularly available. I will say it before Stewart Stevenson does: there is no rail in the constituency of Banff and Buchan. Big infrastructure investment is needed before what you describe can come to fruition for rural communities.

Jess Pepper: Looking to the future of rail, we are working on projections, with a costed and timetabled plan for what needs to happen between now and 2030. We are also working with bus companies and our members on what needs to happen to encourage modal shift, asking what would make bus travel easier and more attractive and where investment needs to go to make it accessible to everybody.

Morag Watson: Mark Ruskell asked about innovation. Our members’ view is that the majority of the technologies that we need to meet our clean, green energy needs already exist in Scotland. They are well established—onshore and offshore wind, solar and hydro technologies particularly so. Our members are also at the cutting edge of innovation around the new technologies. Scotland is a world leader in wave and tidal technologies—in particular, through the centre in Orkney that is developing those technologies. We also have the world’s first offshore floating wind farm. Those technologies are already in place.

For further innovation to take place, and for those innovations to come to market, a long-term ambitious target and a stable policy environment are key for our members and will provide the space in which people can have the confidence to invest, innovate and bring forward the new technologies that we will need.

11:15

Dr Casey: That question is possibly most relevant to the cement and lime sectors in the UK.

Almost all of our members are involved in the research and development part of CCS and how we capture CO_2 from the cement plants in the first place. Of course, we need Government policy and intervention on the whole transport and storage part.

Our bigger problem is that we know that CCS in the cement sector is not a nice-to-have but is absolutely vital. It is the only way that we will get rid of the process emissions. Most of the cement plants in the UK are located outside the main clusters where all the focus is at the moment, which is completely understandable. However, we need a plan for how CCS will be expanded to those more isolated sites. The CCC report missed an opportunity to start thinking about a plan for doing that.

When CCS is put in place, it will double the operating costs of cement production, so some sort of protection will be needed for the sites that move first. That might be provided through procurement, which was mentioned in the earlier session, or through tax breaks. Otherwise, they will just go out of business.

Andy McDonald: I will pick up the point about innovation. One of the big advantages of the changes that we are seeing is that they are whole-system changes. We recently supported innovation work on a hybrid ferry, and we are now looking at hydrogen ferries. With our partners, we have brought in funding from European programmes as well as from UK programmes to do that. The ferries are also being used as part of a broader development of technology, particularly in the case of the hydrogen ferry, which will go to Orkney. It is part of the much broader work that is going into Orkney using renewables and the whole energy system. The ferries will be part of the mix: renewable energy will generate the electricity that will generate hydrogen that will then supply the ferry. It is about looking at those things as part of the whole system.

In transport, as Jess Pepper suggested, we started with some of the relatively easy stuff, such as hydrogen buses and local authority vehicle fleets, but we are similarly broadening out that work. With Transport Scotland, we are developing a joint plan that is looking at rail and the opportunities in Scotland for hybrid or, ultimately, hydrogen technology, including in heavy goods vehicle transport. We are looking at the opportunities in infrastructure—for example, where constrained wind developments might provide the energy to allow us to resource some of that down a transport corridor, initially where electrification of the rail network has not happened.

We recognise that transport has to be multimodal as well as intermodal, perhaps through our bringing in new modes, and that the whole system has to be joined up. Again, we are working with our partners in the likes of Transport Scotland, the transport companies, the bus companies, the bus builders and the development and running companies.

Professor Campbell: On the point about innovation and global competition, a lot of things will be selected out by global competition, so we need to think about what is authentic to Scotland. What are our natural strengths? Many people have made that point.

That is also true of the Scottish science sector. We are world leading in science—that is true of the environment, food and agricultural research institutes—and we need to think about how our natural assets play to those technological strengths. Two of the things that we have in abundance are renewable energy and water, and we still need those natural assets for growing food. Water will be very scarce in the world, and a lot of food that is grown will have a high water cost. Scotland will have more rain in the future, and we are very good at growing food, so the question is how we will compete internationally with our brand of a high-quality environment and a sustainable food production system. We need to think about how technology and our natural assets fit together.

Will Webster: The question about the balance between private and public sectors and competition was a good one. Delivering the objectives of the Climate Change (Emissions Reduction Targets) (Scotland) Bill and the CCC will need a vast amount of investment.

We can do a back-of-the-envelope calculation and arrive at however many hundreds of billions of pounds it will be, but the balance between incentives and regulation really needs to lean towards the incentives side, because we have to deliver large amounts of investment. There needs to be a positive framework for investment, whatever it is.

That is, in part, the lesson from renewables and, in particular, the offshore wind sector. Over a number of years, a regulatory and commercial framework was developed that was supportive of investment, and, as a result, the costs came down rapidly. That approach needs to be rolled out into other target areas such as carbon capture and storage.

In that context, a question that needs to be asked is not just what the most advantageous technology is but what that technology is being used for. Electrification will work well in some sectors, such as small commercial vehicles, but it will not yet work as well in other areas of energy use, such as heavy freight, heating, some industrial uses and cement.

We need the full range of technologies if we are to achieve reductions across the board, and the news item of the CCC is that if we want to go to net zero we cannot have sectors that are outside that framework.

The answer is that positive incentives are needed to deliver investment, but investors are going to want to see a long-term framework for particular technologies that need to be applied in different circumstances. There are 20 or so CCS projects around the globe, but most of them have been developed on quite an opportunistic basis in particular circumstances. If we want to develop the technology as an industry in its own right—which it will need to be—there are quite a few legislative gaps that need to be filled. A framework of legislation needs to be developed to make that happen at scale—and it is when something happens at scale that the cost reductions happen.

The Convener: Is the message getting across that fuel sovereignty is a big issue for the UK? I am not sure of the numbers. Do we produce about 60 per cent and import the rest, or is it the other way round?

Will Webster: That takes us to the point about the need to make the most of the industries that we have and the position in which we find ourselves. There is still a big consumer desire for gaseous fuels and fuels in liquid form, which will probably continue, albeit that it will change to some extent. That is a fact that has to be dealt with during the transition. We have to give consumers what they want, to some extent, and what they are used to.

Our net imports of oil and gas are about 60 million tonnes of oil equivalent out of a total consumption of 150 million tonnes of oil equivalent. We are starting from a position in which 75 per cent of the primary energy that is used in the UK—in Scotland, too—comes from oil and gas. We have to start from where we are, and we have to make the most of the advantages that come from that heritage. That has to be part of how the UK—including Scotland—develops its net zero pathway. Although our pathway will have lessons for other countries around the world, other countries will have to follow their own pathways to some degree.

Andrew Midgley: I have a quick comment on innovation, with specific reference to agriculture. The industry is innovative at the moment and adopts new technologies readily. We are supported in that by the research institutes, which are a strong base for us in Scotland.

The question was about the relative weight of private activity versus the role of the state in driving innovation and about whether innovation should be left to the market and so on. The innovation that the industry adopts at the moment is, I suggest, driven mainly by the market. It is about servicing what the market wants, securing efficiencies in the industry and so on. However, when we talk about innovating to reduce emissions we are getting into the realm of the delivery of public goods, where the market is less of a driver—unless we can find a monetary mechanism to drive private innovation.

As we get more into the realm of delivery of public goods, the state has an increasing role to intervene in the delivery of innovation. On top of that, there is the extension work—the work with the industry and the provision of advice and support to enable the spread of that innovation.

John Scott: I again declare an interest as a farmer. I have another question on the delivery of public goods, although I also want to ask about other issues.

I want to develop the idea that was expressed earlier of a new climate change mitigation land class. Andrew Midgley says that the delivery of public goods, such as the restoration of peat bogs, will be hard and difficult to fund and that it will end up being done either by individuals or by the Government. If there was a new land class, might private sector bodies—perhaps pension funds—buy into supporting and sustaining some of the land that will ultimately bring benefits through carbon capture and storage? Is that a reasonable idea? That question is for Andrew Midgley and maybe Colin Campbell. Please say exactly what you think.

Andrew Midgley: The idea that we can deliver public goods through private investment is highly attractive. At the moment, land managers such as farmers and crofters run businesses that generate income from selling what they have grown or reared and they do not necessarily generate income from the other things that they deliver to society. It would be good if we could find a way of putting a value on those other things so that people can receive an income for delivering something that has value to other people.

That has been sought for a long time. Ideas along the lines of what you are talking about have been floated before. For example, the woodland carbon code and the peatland code were specifically designed to create a mechanism to give private investors in what we might call the corporate social responsibility market confidence that, if they invested in a particular type of land management, they would get a clear and rigorously defined carbon outcome.

The idea is great, but I would need to look at the detail. The question that it raises straight away is whether just having a land class would sufficiently underpin that private investment. For example, the

woodland carbon code is quite sophisticated in that it says that, if someone is doing a certain activity, we get a certain carbon outcome. The approach for woodland is different from the approach for peatland, and it might be different for biodiversity, climate and so on. Sophistication would be required—it might need to be disaggregated.

John Scott: Indeed, and perhaps a hierarchy would have to be developed.

Professor Campbell: It is feasible to have a land capability for carbon sequestration map of Scotland. We have information on land capability for agriculture, and every farmer in the country is fully aware of that because their union dues are based on the class of their land—from class 1 land, which is of the highest quality, to class 7 land. We also have information on land capability for forestry. A national map that indicated the areas where we are most likely to be able to sequester carbon is entirely possible. We also have sophisticated models that can predict how much carbon sequestration we can get from planting trees, for example, in certain areas. That is very different from saying that we will have 10,000 hectares of trees; it is saying that we will have X quantity of sequestered carbon. All those things are possible and could provide instruments for people to use to trade in carbon.

The whole area of carbon offsetting in farming is controversial in its framing and how it is implemented. The message that I often get from farmers is that they would like to get credit for good carbon management on their farms and they would like a farm-level inventory rather than a national inventory that is separated in different ways. Farmers get frustrated because they feel that they are doing all the right things but they are not getting all the credit for that.

There are pitfalls in all of that, but it is worth exploring, because we need to get everybody on board, and one way of doing that is by giving them an incentive. There is a lot more to be done in the area, but Scotland is well placed to provide the scientific evidence and data. We have good national land and soils data sets, which could be used to develop the mechanisms for that type of approach.

11:30

John Scott: I will also ask about carbon capture and storage, which I am hearing a degree of scepticism about around the room. As a Government and as a country, we will have a limited amount of money to invest, and CCS would require a significant amount of investment. Should we therefore focus on other things? Given that you are the experts, your scepticism will not be without justification, and I would like to bottom it out.

Angus McCrone: Yes, I was being a bit sceptical about CCS. A country would not want to be out on a limb in pushing CCS technologies that were different from those that were being put forward elsewhere in the world. An element here is that all countries have to move together, albeit perhaps with some a little bit ahead and some a little bit behind.

However, we can do a lot on technologies that we are absolutely clear will be cost effective—probably more than cost effective—through the 2020s and beyond. That includes rolling out electric vehicle charging points and ensuring that dynamic charging is possible, so that people can charge their car when the electricity price is low and, if necessary, discharge to the grid when the electricity price is high. Given that subsidies have been removed for onshore wind and solar, we should also make it as easy as possible for companies and utilities to sign power purchase agreements with new projects, so that those can move ahead on the basis of a fixed electricity tariff. There is also the question of what Scotland should do with its nuclear sites when they come to the end of their lives; there are a number of options that could be cost effective. Those are practical issues for the 2020s.

At the moment, the answer on decarbonising heat, for instance, is not entirely clear. There are a number of runners and riders and we are doing a lot of research on that. It is somewhat similar with CCS; we do not know how cost effective it will be, or what the future carbon price will be and whether that will be enough to get it going. I am putting the emphasis on what we know will be cost effective in the 2020s and trying to maximise that.

John Scott: Is that the view of other industry experts?

Will Webster: Although we would not necessarily disagree, we would take a different slant. The CCC report brings out the need for us to go to the big things that we can change more, and to go to those quickly. That is the difference in going from an 80 per cent target to a net zero target. The emphasis must be on moving all the potential solutions ahead, and then seeing how they can apply in different circumstances for different uses of energy.

As we see it, an unequivocal message from the CCC report was that carbon capture and storage is not an option but an essential. We see it as having strong potential in a lot of areas. The first areas will be industrial uses of heat and use in industrial sectors, but it will probably have applications in several other energy uses as well.

However, we will not find that out until we develop a programme at scale.

I caution against the idea that there is a fixed pot of money. If we have the mentality that there is only so much to go around, we will not achieve net zero. The CCC report was unequivocal and frank about the costs that that will involve—1 to 2 per cent of gross domestic product. Whether that is 1 to 2 per cent of Scotland's GDP or 1 to 2 per cent of the GDP of the rest of the UK, those are not small sums. That has to be recognised as part of the process.

The Convener: I will bring in Stewart Stevenson, who has a particular constituency interest in CCS.

Stewart Stevenson: Yes. I want to go back to the first remarks that Angus McCrone made to try to tease out his antipathy to CCS. I know of six technologies, which means that there are at least 50. I want to ask about the difference between pre-combustion and post-combustion. Retrofitting old kit with post-combustion capture is clearly quite expensive and there is a limited period in which you get your capital back. In pre-combustion, you essentially focus on building totally new facilities, in which you can control the efficiencies and so on. Furthermore, with post-combustion, it is a one-off build each time. Were your comments addressed at both those technologies? It strikes me that the pre-combustion, new-build approach carries the prospect of economies of scale and redeployment of technologies. Will Webster said that there are 20 or so CCS projects. I know of 18 in China alone, although only two of them are big; 16 are little trial projects. Were you making that differentiation, or were you being broad brush?

Angus McCrone: The first thing to say is that there is no antipathy; I am just making an observation. Our clients are the biggest players in energy worldwide, and they are on the traditional side and on the new side. As you say, there are CCS pilot projects going on. Quite a few things are happening in China, and there are some interesting things happening on industrial CCS. However, on whether the technology is getting closer to being rolled out on a wide scale anywhere, I do not think that we are any further forward than we were 10 years ago. Maybe that will change in the 2020s—I do not know.

The Convener: Is that because the UK Government withdrew funding from carbon capture and storage? Peterhead, in Stewart Stevenson's constituency, was involved in that programme. I cannot remember how long ago that was. Was it five years?

Stewart Stevenson: It has happened twice.

The Convener: You said that there has not been much movement in 10 years, but maybe if there was consistency in funding, we would be able to address that.

Angus McCrone: Policy is obviously part of the answer. In the UK, there were setbacks when the programme was taken away. Around the world, some CCS projects have not gone well and have gone way over budget—

Stewart Stevenson: Do forgive me, but I want to get back to the core of my question. Are you seeing a difference in your economic analysis—because that is what your skill is—between retrofitting CCS and new build, or is there simply not enough information and analysis to give a meaningful answer?

Angus McCrone: CCS becomes a serious option if we get a carbon price that is high enough, particularly on a wide scale internationally. The signs of that happening are not good, to be honest. The EU ETS carbon price is higher than it was, but it is still significantly below where it would need to be to make CCS—whether it is pre-combustion or post-combustion—a practical proposition. Unless that changes, and we get such a climate emergency that Governments completely change their policies and introduce very high carbon prices and so on, the advance of technologies that show rapid reductions in cost will probably be much more a feature of the 2020s than CCS will.

The Convener: That leads us to the business positives that are out there—the wins for the Scottish economy. There are opportunities in all the sectors that are represented by the panel. We have been talking an awful lot about the challenges. Of course there are challenges, but there are also opportunities. Necessity is the mother of invention. Does anyone want to talk about what they think might be the opportunities for their area? We have talked about what we have got in our natural environment in Scotland.

Elizabeth Leighton: According to the survey of suppliers that I mentioned earlier, all of them were already planning for growth or at least had a plan in the drawer that they could pull out once the button was pressed for clear targets and policies to be set. That went across the board from heating installers to energy efficiency installation delivery agents; they are all ready to go, and they are projecting significant—indeed, huge—growth and export potential for the businesses, which is positive.

As for some of the challenges, which can be turned into positives, there are still some gaps in certain geographies in Scotland where skills need to be developed, and there is a need for further apprenticeships and for more young people to be

brought into the industry. We have an opportunity to support growth through apprenticeships, training, skills development, courses in colleges and so on, and that work could be accelerated.

The good news is that businesses know that the market is growing, because customers are now coming to them and saying, "I want a heat pump," instead of saying, "I need heat—give me a boiler." People have seen these things—they might have friends who have one and like it—and, as a result, the market is shifting, as are attitudes. According to a survey that was recently carried out by Citizens Advice Scotland and which is due to be published, people are more in favour of energy performance standards being regulated for housing. Indeed, some 62 per cent were in favour, the main reason for which was the environment. That shows the shift in attitudes, because when research was carried out a couple of years ago, people were a bit more cautious. We have an opportunity not only to win jobs but to turn this growing interest and concern into opportunities to reduce emissions and get all these other benefits.

Andy McDonald: With regard to carbon capture and storage, we are working to understand some of the economic arguments and challenges in recognition of the fact that this will clearly be a key component of our meeting these new and critical targets. We are therefore working with the production or customer end—however you want to describe it—on the industrial biotechnology that will need to go to the communities, the energy-intensive companies in, for example, Grangemouth or Teesside in the north of England and the identified clusters as well as the oil and gas industry and the Oil and Gas Authority as part of the decommissioning of offshore infrastructure, whether or not that is then repurposed. Indeed, the St Fergus project is a good example of that.

With regard to the industry leadership that we have just been discussing, there is no question but that the previous withdrawal of funding has induced a certain amount of scepticism about the commitment in this respect, but the major corporate global companies involved have also recognised that they will have to address this challenge. If we have the potential to put this infrastructure in place here, we will be able to do that work; in fact, there are pilot projects under way at UK and Scottish Government as well as European level, and we have engaged with other countries around the North Sea to understand the projects that they are working on and to bring all that together. That is the sort of scale at which we will need to address the issue.

There are big opportunities as well as, undoubtedly, big challenges, and the economics of it will need a lot of work, as will the incentivising to ensure that producers recognise that this is a key part of decarbonising their processes. Everything needs to join up and, at the moment, different pieces of the picture are being assembled and looked at, but part of it is about having that economic analysis, because we need to prove that CCS will work, and public and private engagement and incentivisation will be required. However, there are big opportunities in Scotland and the North Sea basin and with the major energy-intensive companies that are important to this country's economy. Our work with the oil and gas sector includes not only the decommissioning of technology but the diversification of the industry base. There is some exceptional technology in there already, which can be applied in a range of other areas of technology and sectors. Part of it will be about addressing the opportunity and challenge in how we move to carbon capture. Use is to some extent a separate element with the industrial biotechnology piece, and there is also the storage aspect.

11:45

Morag Watson: We see huge positives in pursuing the net zero goal. The renewable electricity sector already employs 16,000 people in Scotland and generates £5.5 billion in revenue. As we increase the amount of renewable electricity that we generate in this country, the number of jobs and the revenue are going up. It is important to bear in mind that a lot of those jobs are in remote and rural areas where they provide high-quality long-term employment in areas where there are few other opportunities.

Picking up on Elizabeth Leighton's point, we are keen to see young people coming into our industry. We will be holding our young professionals green energy awards event on Thursday night to celebrate the level of skill and expertise that is entering our industry from extremely passionate young people. We see a very positive future.

In a recent survey, we found that our members are already exporting expertise and knowledge to 73 countries around the world. When we say that we are looking to make Scotland a world leader in renewable energy, that is not just about us meeting our own energy needs but about Scotland becoming a beacon of expertise and knowledge in the world, making us the country that someone comes to if they want to have their own renewable energies revolution.

John Scott: What about the manufacturing opportunities? Thus far, they seem to have passed us by and we would like to capture some of those as well.

Morag Watson: That is something that we are extremely keen on, and our members have

already met to talk about how we can make the most of the industrial opportunities. We have done work with our members to look at lifetime income generation for onshore and offshore wind, and we have found that there is between 50 and 65 per cent domestic content—that is, jobs and work that are going to domestic companies. When it comes to the big infrastructure projects, Scotland is not competing on the world scale as we would like it to. That is a lot to do with a long-term, UK-wide underinvestment in infrastructure. As I say, our members are working very hard to see how we could change that. We do not want to compete just on the knowledge and expertise side; we would like to see Scotland competing across the board on a global scale.

John Scott: Although we might be playing catch-up in that regard, is it your view that there is still an opportunity for Scotland to do that?

Morag Watson: We work on climate change; we are always optimists on these things. Yes, there are opportunities. It could be done, with appropriate investment, but the key will be that appropriate investment and how the money is found for that.

Mark Ruskell: In its submission, Scottish Renewables suggested a clean power plan. Do other stakeholders around the table back that? How does it differ from what we have at the moment, which is a mixture of devolved and reserved responsibilities and an energy strategy for Scotland? Does the idea of a clean power plan build on that and develop it? If it does, where should we go next?

Morag Watson: What we are calling for with the clean energy plan is that we look carefully at the science of what has come out of the CCC report about how many gigawatts of electricity we need to be generating and what the technology mix might be—how much we expect to generate onshore and how much offshore. Working back from that, we then need to look at both our policies and our planning. If we know how much energy we need to generate, we need to ask how much of that we can generate from repowering our existing wind farms, how many new wind farms or other technologies we need to roll out onshore and how many shallow-bottom and other sites we will need offshore to be able to meet that target. Instead of doing what we have done so far, which is to ask where we can find a site and how much electricity we can generate from it, we should look at how much electricity we need and then at how we can meet that target.

Mark Ruskell: Is that different from what we have in the energy strategy? Is it more of an approach than a plan?

Morag Watson: It is a refinement. We are now looking at a new climate change target, a new goal and a climate emergency, so we need to revisit it to make sure that we will be able to hit the targets that we are setting for ourselves.

The Convener: The market will have to change, because at the moment consumers will not go with electricity over gas to heat their homes because of the cost. However, we have targets for electrification of vehicles, so there will be a huge demand for electricity. How can we make electricity cost effective so that it is not seen as the most expensive option for everything?

Morag Watson: That will be a key challenge in the just transition—we do not hide from that. As we said, the cost of electric vehicles is likely to come down and make them more attractive, and another advantage will be their battery storage. A problem for our transition to a renewable energy system will be how to store renewable energy; coal, gas and oil can be stored in their native form before conversion to electricity. Grid services will probably come into the mix, and smart technology will be important so that people can draw electricity when it is at its cheapest and put it back into the grid when they can make the most from that. Those will be key parts of the transition.

Claudia Beamish: Those points lead seamlessly to a question for all panel members about how they see the 1.5°C rise that we are focusing on today—[*Interruption*.] Someone wants to intervene.

It is important that this committee's members hear from everybody, because everyone—workers, businesses and communities—will be affected by moving to net zero by 2045. Will Webster highlighted the positive impact that the oil and gas sector can have by supporting the transition, and I hope and expect that it will be a just transition for the sector as well. It would be helpful to hear from everybody about what their contribution will be. I will value everyone's comments.

Will Webster: I will elaborate on the points that were made earlier. You are right to say that we have to focus on the opportunity that will come from the transition activity. The flip side of the cost will be the opportunity and investment that it will bring. Whatever that cost will be, a significant amount will probably go to offshore investment, whether to offshore wind, CCS or other technologies.

It is a real advantage that the Scottish economy has the expertise in a range of sectors, and also the transferable skills that go across sectors, such as the project management and safety skills that are core competences in our sector and others. Those developments as a result of the additional

investment will be beneficial. We are seeing that already in our supply chain and clients in the oil and gas and renewables sectors, with companies investing across the sectors. An example is the floating offshore wind farm that was developed by one of our members, Equinor, using its offshore expertise. That synergy and locational benefit up and down the North Sea will result from the transition, and its regional elements will be advantageous across the board. The transition process will have different pulls of development compared with what has been typical, which will definitely have regional development benefits.

Claudia Beamish: Have your members shifted their views about where finance should go because of the 1.5°C target, with regard to fossil fuels and the transition?

Will Webster: I can get back to you on that issue. We have a lot of members and they have different strategies. You will have seen in the press that some companies have adopted resolutions from shareholders, who have an important voice. That is a good reason not to disinvest in energy companies. It is an area in which companies are thinking carefully about how they develop their overall strategies—they take the matter very seriously.

Claudia Beamish: It would be valuable if you could get back to us on that.

Andrew Midgley: NFU Scotland views the concept of a just transition as being extremely important. That is partly because of the potential impact on the industry of some of the things that are proposed. There are three broad bits to what the CCC proposes for agriculture, and the first is that the industry must adopt all the mitigation measures that it is possible for it to adopt to reduce emissions.

Recommendations are also made about dietary change—we are talking about a reduction in the consumption of beef, lamb and dairy of 20 per cent. That is a conservative estimate; some would go much further than that. The thinking is that that reduction in consumption will lead to an intensification through a shift towards pigs and poultry, which will free up land for land use change—in other words, 20 per cent of agricultural land will shift to another use.

That dietary change potentially presents quite a big challenge to the industry. At the moment, the production of beef, sheep and milk comprises about 45 per cent of agricultural output, so a 20 per cent reduction will have a big impact. Some people say, "Well, there's accommodation there," but we need to think about the issue from the perspective of our members and of individual businesses. Lots of agricultural businesses are predominantly SMEs—they are not huge—and they have a fairly high degree of reliance on on-going farm support. If the income is changed, those businesses will be put under greater pressure; indeed, we might get to a situation in which it would not be beyond the realms of possibility that a lot of businesses would go out of business. That would involve people losing their livelihoods—in other words, losing their jobs.

Some of the scenarios for dietary change involve a 50 per cent reduction in the consumption of beef, lamb and dairy. We need to think about what that would mean for those sectors. At the moment, 67,000 people are employed in agriculture. If we reduce the consumption of products that are the mainstay of Scottish agriculture, a lot of people's jobs will be put at risk.

There are issues around dietary change. We are not in the realms of determining that people have to do one thing or another, but the industry must adapt. There are opportunities, as the convener's question brought out: there are opportunities to focus on supporting Scottish farmers and on quality. However, a great deal of care is required. That is where a just transition comes in because, ultimately, the changes that we are potentially looking at mean that people's livelihoods and jobs are at risk.

The Convener: There is also the potential unintended consequence of us having to import more food, which would have an impact on the country's carbon footprint. If we do not produce food locally and there is still demand for certain proteins, we will have to import more food.

Andrew Midgley: Exactly. We do not want to get into a situation in which our direction of travel has the impact of reducing the industry's production if we will end up importing products from elsewhere. In that scenario, all that we would be doing would be exporting our emissions.

Claudia Beamish: What support would you like to be provided to people in relation to land use and agriculture as part of a just transition? As a policy change, what would you like to see happen?

12:00

Andrew Midgley: At the moment, we do not have a very sophisticated understanding of the way in which things could play out. Over the past few years, a blunt narrative has developed at international level that livestock are bad for the climate and that, if we eat less meat, we will be making a contribution to tackling climate change. That very generalised approach and understanding keeps being perpetuated, and we want a more sophisticated analysis of what the options for change are. After all, many people on the ground in Scotland have no other option,

because the land is not agriculturally capable of doing many other things.

If we had an analysis of such options and how they would play out, that would enable us to know what we would need to do to support the industry. However, I do not think that we are in that place at the moment.

Professor Campbell: To support what Andrew Midgley has just said, I note that there is clearly a great need for a just transition in relation to land use change if we are to have the transformative shift that is required to meet the climate change targets. That said, it takes a long time to develop land to full productivity and maintain it at that level.

Livestock is under a lot of pressure, particularly from trees, but there are transition land use approaches that we could look at, such as agroforestry, in which trees are spaced out to allow sheep to graze. In fact, because the trees provide them with shelter in the spring and autumn, sheep can have a better energetic balance, which in turn reduces greenhouse gas emissions.

The big question, though, is how farmers transition to being foresters. In other countries such as Sweden, people are farmers in the spring, summer and autumn and foresters in the winter time, but here we train people to be either farmers or foresters, not land use managers. We need to do a lot of transition work around the culture as well as the methods, skills and knowledge that people will need in future in relation to types of transition land use.

The loss of agricultural jobs is quite a serious issue for the management of our landscapes. Farmers are not just farmers; they manage our landscapes and the ecosystem services that we get from our land, and we need to think carefully about the consequences of, say, land abandonment. Just transition in land use is a huge topic for the agricultural sector.

Jess Pepper: I want to go back to the question about the economy and jobs. I outlined the opportunities that we will have with buses, trains and ferries if we invest in them, but we need to look across the system and, as far as the economy is concerned, think about how and where we work, how we can avoid certain types of shift and how we can improve the forms of travel that we need. For example, we often think about modal shift from car to bus, rail or active travel, but in fact the shift might be from air to rail as a more efficient way of working.

We need to think not just about the jobs in the sector, even though they are hugely important and they present us with opportunities, but about the functioning, efficiency and resilience of the whole economy. There are issues with regard to infrastructure as well as our wellbeing, and that is where the transition needs to be just. After all, it is not just about jobs and the economy; it is about everyone.

We keep hearing the word “enabling”; indeed, in the previous session, the witnesses talked about people knowing what is right for their place. Sometimes we think in big chunks, but these things come in many little chunks, and there has never been such an appetite to mobilise people to get engaged, change their behaviour and make a difference. There are real opportunities to be had here. For example, on travel, many of our journeys are small, and we could all be making huge differences in that respect. That cuts across the sector.

If we can enable people to make such changes and be part of the solution and if we as a nation can put everything on the table and figure out what we collectively need to do, that will also be good for our public health. The witnesses in the previous session talked about folk feeling overwhelmed and daunted by the challenge, but as we know—and as public health consultants tell us—once people feel that there is something to buy into and a solution that they can be part of, they have a really compelling vision that can motivate them and make them feel better, happier and healthier.

The elderly and the children and young people who are engaging in this debate are often at the margins of these services. Investing in our bus system could be a huge help to the 14-year-old in a rural community who might want to do a Saturday job in another community but cannot do so because the buses do not run on that day, or to elderly folk who depend on connectivity to get out and about and be functioning. As a result, investment in the local economy has wide-reaching benefits.

We know that, in communities that are better connected, people feel that they can be in their homes for longer, which means there is a reduction in the costs of health and social care. We can build resilience into our communities in that regard. Transform Scotland recognises the missed opportunities regarding the compelling vision for active travel, for example. However, the UK advice was more about the big chunks, such as carbon capture and storage, than about all the little chunks that can make such a huge difference.

The Convener: You raise an important point that is relevant to many sectors, which is that there are small and easy wins that are based on a change of perception. You mentioned that people want to do something but little things stand in their way—for example, safety is an issue for active travel.

I will bring in Margaret Simpson of the Freight Transport Association, because I am aware that freight is carried not just on roads but on rail. Could there be an easy win from the fact that the rail freight option is underused?

Margaret Simpson: To be blunt, no.

The Convener: Okay.

Margaret Simpson: The reason is that 90 per cent of freight involves road travel and we will not change that at all. At best, we could get about 5 per cent of freight off trucks and on to rail, because rail is suitable for carrying bulk goods such as whisky—if we get the gauge right, as it is not right across all of Scotland's network—and timber. Some recent figures might help to build the picture. For example, the FTA estimates that, for a town with a population of about 100,000, an average of 4,500 tonnes of goods is moved every day. If we break that down, 187 tonnes are picked up or dropped off every hour. If we take Edinburgh as an example, 21,600 tonnes are moved each day, which is 900 tonnes an hour.

When we look at that broad spectrum, it is important to note that the movement of goods has nothing to do with vans but is done by trucks at the heavier end. There are 24-tonne trucks, but they cannot carry 24 tonnes; they can carry only up to 10 tonnes, which is the average payload. That means that, on average, 90 HGVs are in the city of Edinburgh every hour. That is nothing to do with parcel delivery; it involves everything else. Parcel delivery is a really small element of the movement of goods. People tend to think that freight is about parcels being delivered from Amazon, for example, but it is actually about everything else—the bricks, the wood, the coffee, the milk, the clothes and so on.

If we think about the amount of freight that goes into the city of Edinburgh, we can see that we would not be able to shift all of that with freight trains. We should think about the city as a consumer that has all sorts of demands for all sorts of different products that have to be brought into the city at different times of the day. The position changes massively when events such as the Edinburgh international festival take place—the uplift of goods is huge because of the number of extra people in the city.

Where it is possible, some more freight can be put on to trains. We support that and we have members who are looking at it. There are some constraints regarding weight, though, because when the rail freight gets to its destination, it inevitably has to go by road for that final mile. We need to make it easier for containers to come off the back of trains and on to the back of trucks to be moved to their final destination, which would be a distribution centre.

An element of freight can be moved by train, but we need to be cautious about how much that can be done. Our road infrastructure is vital to our economy, and the way in which we move goods around this country is by road. There are definitely opportunities to move freight by rail, but they are limited. It is about making the road infrastructure as reliable as possible and putting the best and cleanest vehicles on to it.

John Scott: Are there any maritime opportunities? For example, much of our food and other products arrive by sea in containers.

Margaret Simpson: That is being explored. Recently, we had a consultation with a company that is looking at reopening the Rosyth to Holland route. The key point for me in that company's presentation was that it would have 10 times the previous capacity. The Rosyth to Zeebrugge route did not work because we could not get enough trucks on to it. I think that only seven or eight trucks could be taken at a time. Now, however, we could be looking at up to 100 trucks going on a crossing.

For products that are not time sensitive, there would be no problem in using that route. However, there are just-in-time products that must get to their destinations quickly, such as those from the fishing industry up in Mr Stevenson's constituency. There is no other option for such products than to take them south by road as quickly as possible and sell them in their marketplace. Putting them on to a ship would not work. However, putting products such as whisky on to a ship and taking them across to America or wherever absolutely works.

Claudia Beamish: Is your organisation looking at the model that has been mentioned previously in the committee, which involves consolidation hubs outside cities and smaller—possibly electric—vehicles using them? That has been funded by EU money, which I hardly dare mention today.

Margaret Simpson: An urban consolidation centre would work in some scenarios, but we need to be quite clear about what they are. Freight and logistics are, by definition, all about efficiency. Freight is already consolidated on the back of the biggest truck, which can make one journey and do all the deliveries. If that additional link is added to the supply chain, there will be additional costs.

Parcels transport would probably work in an urban consolidation centre. I foresee no problem with that; parcels could be put in the back of electric vans. Members should, however, be aware that a 24-tonne truck can, as I said earlier, carry 10 tonnes. If that truck is replaced by vans, 10 vans would be needed to go into the city.

As far as transport is concerned, congestion and its stop-start nature is the biggest climate problem. Vehicles are needed that are able to run slowly and steadily at a set pace through the city, get to delivery points, drop things off and move on.

Claudia Beamish: With respect, if they are low-emissions vehicles, there is not the same argument, is there?

Margaret Simpson: No, but there are emissions apart from those from the tailpipe—from tyres and brakes, for example.

Claudia Beamish: Okay. We can discuss that at a later date.

Stewart Stevenson: In transport, to what extent can we benefit from extending the life of our equipment? There is a big embedded-carbon cost in building a lorry or a truck, for example. I am thinking of my experience: I run an eight-year-old car that has never broken down.

The Convener: Do you realise that you have just jinxed it?

Stewart Stevenson: The depreciation rate of my car is £1,000 a year. In 2005, the depreciation rate was £5,000 a year. More to the point is that that tells us something about the carbon footprint of using things for longer. My question was directed at the FTA: it is a general one about using things for longer in order to distribute embedded carbon over more effort for more benefit.

Margaret Simpson: Members of the FTA have different uses for different types of vehicles. Things depend very much on the mileage that the vehicle does and the terrain on which it does that mileage. If the vehicle does what we call milk runs——short and regular journeys—it will have a longer life.

The industry as a whole is moving very much towards the Euro 6 emissions standard. We have estimated that, by 2020, about 50 per cent of vehicles will be on Euro 6, which is the cleanest option for diesel. The industry is looking at alternative fuel options, but there is no stand-out option yet.

I absolutely agree with Mr Stevenson about understanding the options and vehicles' lifespan. Obviously, for all organisations that run heavy goods vehicles, procurement, the life of the vehicle, and what they will ultimately get when they sell the vehicle on are very important. It is important to realise that the person who has a Euro 5 vehicle will get a lot less money for it, because people will not want to buy it from them. It is all about Euro 6.

Jess Pepper: That is an area in which there is a huge win to be had, but we need to look creatively at all the options, because one size will not fit all.

We can look elsewhere. In the Netherlands, for example, a zero-emissions network for freight is being put together in statute, so that potential is being examined. We can provide more information on that, if it would be of interest to the committee.

Elizabeth Leighton: There is an interesting example from Renfrewshire Council of using things for longer. The council is combining retrofit, build, and maintenance and repair budgets in looking at its housing stock, and it is finding that it will be more cost effective to do a deep retrofit. That means bringing buildings, as far as possible, to a standard that will achieve net zero emissions, rather than tearing them down, looking for new land, applying for planning permission and all that that entails—never mind the embodied carbon emissions that would be incurred. The council is taking that route because it has decided that that will be cost effective over the longer term. Deep retrofit is an example of an approach that can be taken.

12:15

I will segue into quick wins. We are in a state of climate emergency: quick wins can be used to give comfort and to give signals that we are on this. There are no-brainers that we can get on with and, at the same time, we will all work together on longer-term plans and strategies.

I am sure that all of us could come up with a top three of quick wins that could be put in place today in order to send signals. New-build housing regulations offer a quick win. Philip Hammond has already talked about that for the rest of the UK. Will we be left behind? Why should we connect new homes to the gas grid? That is just one example. Why are we funding replacement oil and liquefied petroleum gas boilers for the fuel poor? We should put those people on to renewable heat and accept that an additional cost will be involved.

Stewart Stevenson: As I have said before, there is, when the nearest engineer is more than two hours away, a huge disincentive to changing technology. I was going to do that until I discovered how far away the engineer was.

Elizabeth Leighton: There might be such examples, but Government money should be invested in low-carbon technologies and should not perpetuate yesterday's technologies. There are quick wins; a quick win that we have proposed to the committee is to put in the bill a target that the vast majority of homes should reach EPC band C by 2030.

If we are in an emergency, we should not run around in a panic—we should take considered action to reverse or repurpose policies. We should use discretionary funds to implement projects and do the research that needs to be done. It should

look like a full mobilisation effort. The climate change plan will be revised, but that is not enough. We should treat the situation as an emergency and give people comfort, and we should signal the direction of travel and say that it will accelerate, so people should get on board.

Mark Ruskell: I would appreciate quick views from round the table on the infrastructure that we will need in order to deliver a low-carbon economy. We talked with the previous panel about locking in high carbon emissions, perhaps through investing in the wrong type of infrastructure. We have heard an example that relates to housing, which is about private infrastructure and public infrastructure that add up to a form of national infrastructure. Are there other examples of how we should invest differently? I do not know whether we have got the balance right.

Morag Watson: On the key infrastructure that will really make a difference, Elizabeth Leighton touched on heat networks, which are exceptionally common in Europe, particularly in Denmark, for example. We need to put in place the planning policies for them now. We acknowledge that the new heat networks will probably be powered not by renewable energy but by gas, but once they are in place, changing the fuel to a renewable source will be much easier. If we wait until we have the renewable source before we put the networks in place, that will be too late.

Another important piece of infrastructure that we should consider is wind farms. A lot of the heavy lifting for them has been done—the grid connections, substations and access have been put in. As a wind farm reaches the end of its operational life, which is 20 to 25 years, the turbines are taken down. Repowering wind farms involves putting up new, modern and more efficient turbines, which are generally taller than the existing ones, so people will see them more, but a site can use fewer turbines to get the same amount of electricity, or more.

On embodied carbon and recycling, there is pioneering work being done in Scotland on how to recycle parts from our wind turbines. The embodied energy that is used in our low-carbon-generating technologies is itself being decarbonised.

Professor Campbell: For agricultural land use, there are a lot of new technologies that rely on having the internet of things available in all parts of the country at the right kind of speeds. A lot of robotics and artificial intelligence methods are coming that will mean that our systems are more efficient and produce lower greenhouse-gas emissions. That will depend on the wireless infrastructure being ready in remote parts of the country.

The other thing to think about in respect of land use is green infrastructure. I suspect that that is not what Mark Ruskell was referring to.

Mark Ruskell: That is part of the national planning framework.

Professor Campbell: There are natural assets. One of our new ways of thinking about agriculture is about how we redesign diversity back into the system. That means having multiple varieties of crops, growing different crops and intercropping, and making sure that there are weeds at the margins of the fields that can attract the right pollinators and predators in order that we can reduce application of chemical herbicides. There are lots of ways to think about infrastructure: putting diversity back into our green infrastructure is a major one.

Jess Pepper: I talked about the good stuff. A recent Scottish Parliament information centre publication highlights that our pipeline spend indicates that we are, having reduced the amount that is spent on high-carbon infrastructure, heading towards locking in more high-carbon infrastructure in the future. That is a worrying trend. Clearly, we are in a climate emergency, so we need to review that.

I have borrowed from a climate striker the model that I am showing now of what the problem is in transport. Each Duplo block in the tower represents 1 million tonnes of CO_2 equivalent. The blocks at the bottom of the tower are public transport, bikes and trains. The top blocks are air travel, so we welcome the decision on air passenger duty. The yellow blocks in the middle are road traffic.

An alarming thing that has been brought to my attention by climate strikers is that we are currently pulling down woodland and moving around high-carbon and agricultural soils in order to build new roads, which is where the bulk of our investment and our planning have been going. The roads that are being built are sometimes not even subject to assessment in respect of climate change. When a strategic environmental assessment is done, what is important is generally ruled in. The A9 dualling programme, for example, did not scope on climate. That project will target thousands of hectares of woodland, and a lot of high-carbon soils, including peatlands, are being moved around. Our road building programme is something that we need to reassess and reconsider in a climate emergency.

There is a great case for investing in repair and an important case for investing in what needs to be done for safety. We need to be thinking about the whole system, and how we make it accessible to everyone. Electric vehicles will be part of the solution, and we should take a steer from the

advice and lock into statute the ambition to transition to electric vehicles. We need to think carefully about what the whole system does for everyone, although not everyone will have access to an electric vehicle or be able to invest in one.

Will Webster: On infrastructure, the issues that come up are chicken-and-egg issues across many alternative technologies. For electric vehicles, infrastructure is needed for charging. Infrastructure is needed in order to use hydrogen for transport, to convert the gas networks for them to use hydrogen and to allow different specifications of gas to be used in the network.

A carbon capture, use and storage advisory group is sitting and will produce its report in July. It envisages a disaggregated model, with carbon capture being one part of the value chain and transport and storage being a different part. Again, there is a chicken-and-egg issue, because you will not build storage unless you think that people are going to capture, and you will not build capture facilities unless storage is available. In modal and structural shifts, those are the sorts of infrastructure issues and questions that arise. They go to the heart of the debate about where the dividing lines lie between the roles of the market and those of the Government.

An important insight from the CCC report on all the work that goes with energy transition is that the infrastructure side is key. It also comes down to market design: for example, the way that the electricity market functions was overhauled as part of the development of renewables. Other segments of the market might need to have such changes in policies that go with setting of targets.

The Convener: Hydrogen has been mentioned several times in passing. The oil and gas industry maybe has a role to play, if hydrogen is to be the replacement fuel for the gas grid or for HGVs. Angus McCrone's written submission states:

"Hydrogen is potentially part of the answer on residential and industrial heat, and indeed on long-haul heavy trucks, but"—

this is the bit that I have highlighted—

"it would have to be produced using electrolysis, not fossil fuel cracking".

Will you explain why you say that?

Angus McCrone: That goes back to CCS, which was supposed to happen but never did—

The Convener: Is that the reason why? Is it because you do not think that CCS will happen?

Angus McCrone: If we produce hydrogen using fossil fuels, we must also deal with the CO_2, so we will either let it go or store it. I am slightly circumscribed in respect of what I can say, because we are literally about to publish a stream of stuff on hydrogen and the future economics of things such as electrolysis, so I cannot leak that.

Electrolysis is interesting. The two main ingredients of it are water and electricity, and Scotland is the Saudi Arabia of water and potentially has plentiful supplies of renewable electricity, which could be made reliable round the clock with batteries or by using hydrogen infrastructure. It is a potentially interesting area for Scotland. However, I counsel a bit of caution, because we do not yet know exactly what will happen with electrolysis in the next 10 years, although what people like us say about future costs will have some impact. It is an interesting area to watch.

The Convener: It seems that there are two different technologies, and the one that gets there first could be the answer on hydrogen.

Angus McCrone: Yes.

Will Webster: I do not want to get into the battle of the technologies, but we can already do steam methane reformation to produce hydrogen. Obviously, we then have to have a process for capturing and storing carbon, which is a not insignificant challenge. Those technologies will take different paths. I return to my earlier point: we do not have to choose today. We have to try all those things and get them off the ground at scale; then, the situation will work itself out over time. Currently, if we want to develop the hydrogen economy quickly, that will have to be on the back of steam methane reformation.

In the future, we will have reliable surpluses of renewable electricity with which to do electrolysis, and that will definitely be needed, but the sequencing that we envisage has steam methane reformation going first, and we will take it from there. They are both challenging, so I would not like to say which is better than the other. However, the imperative of getting to net zero emissions means that all those technologies have to be tried seriously.

The Convener: Angus MacDonald is next. Sorry, I mean Andy McDonald. Angus usually sits where you are, Andy, so that makes it even more confusing.

Andy McDonald: We are in the midst of the debate about electrolysis and steam methane recovery: which will be the solution in the longer term at scale? My team has a foresighting group, which has done some economic analysis. We are considering extending the work that we are doing on hydrogen into heavy transport partly to establish what we can do now in Scotland at scale. If we get to a point where we are injecting hydrogen into the gas grid, the dynamics and the economics will change. For the moment, however, the opportunities in Scotland are around heavy

transport, because that is what we have. To pick up on Will Webster's point, I note that we need to be testing and proving that now because it will be part of the solution, wherever the fuel eventually comes from.

12:30

In response to the broader question that Mark Ruskell asked about the impact and how we can avoid catches, I note that the work that we are doing on local energy systems with many partners in Government, utilities, community groups and others is partly so that we can understand what the right solutions for different places are. We looked at typologies for what an island community would do, for what is important for an off-grid rural community, and for what an urban community, an industrial estate or an industrial complex might do. Different places have different needs, so if we want to change how our energy system works, we have to take the opportunity to capture that and find the best solutions for different communities and the best and most advantageous way of bringing together a group of technologies in doing that.

It is clear that it is no longer only about the grid bringing in electricity. In Orkney, there is a pilot project in which council vehicles use renewable electricity that is generated through the European Marine Energy Centre's testing of marine devices to produce hydrogen through electrolysis. There is also work being done on grid management and how networks work across the group of islands. Those things are being piloted for the future.

We are also trying to take that understanding and share it in countries that have similar communities, including Denmark and Canada, in order to understand how we can test the ideas further, because they are part of the global solution and part of the very local solution for those communities.

The Convener: As we are in our final 10 minutes, I ask the two members who still have questions to ask them together. We will then put them out to everyone and people can signal to me if they want to answer.

Claudia Beamish: Our convener has highlighted the opportunities in relation to net zero emissions by 2045. Do any of our witnesses want to comment on investment in research, both in commercial companies and in the public sector? That might relate to pension funds, divestment and reinvestment in relation to the relationships that companies have with shareholders, how companies and shareholders can effect change and what Mark Carney highlighted—it seems a long time ago now—to do with stranded assets. Responses will have to be brief, but I would like to hear any comments on finance.

John Scott: My question is about big infrastructure projects, although it ties in with Claudia Beamish's question. Mr McCrone described Scotland as the "Saudi Arabia of water". Self-evidently, with water tables, ground water levels and reservoirs falling in England, now is the time for someone—I will not say who could afford it—to look at a pipeline to export water from Scotland.

I have to declare an interest, as I have a small company in that regard, although it is absolutely dormant.

Is that an opportunity, in a strategic sense, for the whole of the United Kingdom? If we do not do it and the need becomes critical, it will be too late to say, "Oh, I wish we'd done that 10 years ago." Given the length of time that such projects take, should we be thinking about it now?

The Convener: Would any of our guests like to give us their thoughts on any of those questions in our final few minutes?

Morag Watson: I am afraid that I cannot speak about the export of water. Generally, water and electricity do not mix so well, so exporting water is not something that my members do. However, I will pick up the question about investment opportunities.

Scotland is regularly seen as one of the top countries in the world for renewables investments. When we look at what is happening in offshore wind, we see billions being invested in the North Sea, so there are indeed amazing opportunities for investment. That is one of the reasons why we welcome the net zero target so much, along with what we hope and expect will follow, namely a supportive policy environment.

What I have said about innovation is true for investment: where we have stability and an ambitious target, investment will generally follow, because people know that if they make an investment, it will have a long-term future. Therefore, we are extremely optimistic about investment.

Claudia Beamish: But will that help with big contracts? I do not want to go into any detail, as we do not have long left, but I am thinking in particular of the concerns this week about Burntisland Fabrications. Will you comment on the prospect of big contracts for Scottish workers?

Morag Watson: At the offshore wind summit on 2 May, which I mentioned earlier, a great number of our offshore wind members met Mr Mackay, and a letter was subsequently sent on 16 May to the Economy, Energy and Fair Work Committee, setting out what we are looking to do in that

respect. As I have said, our members really want to work with Scottish companies, but they are stuck between a rock and a hard place at the moment. Offshore developments are funded through the Westminster contracts for difference process, which, because it pushes for the lowest possible price, forces people to look globally for suppliers. As I have said, we want the Scottish infrastructure side of things to compete in the global market for projects not just in Scotland but all round the world and, as Mr Mackay's letter to the Economy, Energy and Fair Work Committee sets out, we have come up with a list of actions that we hope will make that a reality.

Will Webster: On the point about investment and divestment, we do not see things in such black-and-white terms as far as energy production investment or divestment is concerned. We have to recognise that there are other energy policy goals around, such as access to energy, which is one of the UN sustainable development goals and which, we would argue, has a value in its own right. Where companies put their money is not a black-and-white issue.

Moreover, all companies are different, and they all have their own strategies. If you are a shareholder in a company, you have the right to ask about stranded assets and so on; in other words, the value in retaining a stake in a company is that it gives you a voice, so we do not think that divesting from particular sectors or companies is a good idea, unless there is a commercial reason to do so. If you do not get an answer to your questions about a company's strategies, that is fine—

Claudia Beamish: Just to clarify, I was not talking about divesting from companies—I talked about reinvestment, too. I am not being defensive about that.

Will Webster: I understand, but as an institutional shareholder, you have the right to question a company's strategy. That is really valuable, and if I were involved in such an exercise, I would counsel against taking yourself out of the tent. As a shareholder, particularly an institutional shareholder, you have a voice in those kinds of commercial questions.

Finally, on the investment question, I have already alluded to the fact that, with the big changes that have happened and which will need to happen, there is an institutional framework that takes you from the example project to the first-of-a-kind at-scale project to the state of affairs where such things become normal. That is where Government and policy come in; indeed, that is the role that the Government has played in the renewable electricity sector, and the important next step in all of this is to ask these sorts of questions about the implementation of the policies for delivering the targets.

Dr Casey: My biggest concern about investment, particularly in energy-intensive industries, is the need to remain competitive in the UK. A big opportunity has been missed in looking just at territorial emissions, because if you moved to a consumption-based emissions system, it would give the industry a little bit more certainty that you are keen to attract their investment while they decarbonise.

All our carbon budgets at the moment could be met through deindustrialisation, but that is not good for the economy. If we moved to consumption-based emissions reporting, we might attract more investment in the UK. It would be interesting to see whether we could repatriate some of the industries that we have lost and bring more of the consumption issues back under our control. That would be better for the environment and great for the economy, and it would send great signals to industry that we are wanted in the UK and in Scotland.

Angus McCrone: That was a good point.

The opportunities for Scotland, and the fact that investors are putting pressure on companies, means that companies are treating sustainability far more seriously than they have ever done. We are seeing that in the response to the work that we are doing. That effect is going down the supply chain as well. It is not just the head office of Walmart or whatever that is being affected, but everybody that those companies deal with. That is happening globally.

What Scotland can offer is very cheap renewable energy. If companies want to source 100 per cent of their electricity from renewables by a particular date in 2023 or whatever, the cleanest way to do it and be sure that they are enabling new projects to be built is by signing power purchase agreements with new renewable energy projects. That could be onshore or offshore wind, so there is an opportunity there for Scotland to take advantage of its natural resources and become part of that.

Andy McDonald: I want to describe a couple of relatively small pieces of both jigsaws. First, we have not been asked to help to start the pipeline yet, but responsibility for our part of the hydro nation project, at a Scottish level, sits with my team at Scottish Enterprise. We are seeing a lot of interest in technologies to do with improving water quality and in developments that are exportable and tradable, and that are being taken to parts of the world where they have significant impact.

The other piece is from a public sector and investment perspective, and concerns projects that we have worked on with communities. Some

of the innovative early-stage technologies have been supported through the renewable energy investment fund and the energy investment fund. We are working with my colleagues in the Scottish Investment Bank to try to put cases forward for the work of the new Scottish national investment bank, which may be of a significantly greater scale. We hope that it will focus on low carbon, and we are looking at whether it might be able to extend its reach into other areas with more capital.

The Convener: We are rapidly running out of time. We will have a quick comment from Andrew Midgley, followed by Jess Pepper.

Andrew Midgley: I hope that I am not too far off the topic. Various forms of investment are needed, specifically with regard to farming. I am thinking about the policy context that SMEs find themselves in at the moment. There are opportunities, and people will be seeking to identify and invest in those opportunities, but they need clarity on the direction of travel so that they know where their businesses are expected to go.

That applies in the food chain, too. People need to invest in and support the industry, and need to be confident that there will be an on-going market.

Finally, public investment is critical. That relates back to the issue of public goods, and the role of the state versus private investment. The role of the state in the delivery of public goods is critical. The state needs to invest in advice, and in infrastructure in the industry. I am not necessarily talking about just handing out money. It is about helping people to invest through soft loans and things like that. There is a whole range of things that can be done.

Jess Pepper: I will be as quick as I can. To go back to where we started, we know where we want to go now, which is great, but we need certainty about how we get there, so that folk can invest and have confidence in the approach and can map out how they will contribute.

That might mean that we need something more than just policy, because policy has not always worked in the past. There might be things that can go into a statutory framework that is more about the how. The climate change plan was quite sectoral before; it is about giving the sectors the certainty that they need while achieving some level of integration, where there are synergies—soils are important across the board, from all sorts of different angles.

We might need someone to champion such an approach. We might need a climate commissioner or commission, to oversee work, make new, creative connections and encourage sectors in which there is a bit of sluggishness.

12:45

The Convener: Colin Campbell wants to comment; I will be kind and bring you in, because you are from my neck of the woods. Please be brief, though.

Professor Campbell: I will try to be as brief as I can. I cannot answer the question about the pipeline fully, but I can tell the committee that about 160 billion m^3 of rain falls in Scotland some years. However, it can be 100 billion m^3 sometimes; there is a lot of variation, so we need to be careful about what we do with our water—despite the fact that yesterday's rain is tomorrow's whisky.

On funding, research and science are a vital part of our infrastructure. We have had a lot of cuts to research over the past 10 years—that is about austerity and research not having a protected budget. I would like to think that a climate crisis would mean more money for research in future.

The Convener: I thank everyone for their time today. That concludes the committee's business in public. At our next meeting, on 4 June, the committee will take further evidence in relation to the Scottish Government's budget.

The committee will reconvene in private at 2.30 this afternoon to consider the evidence on the bill that we have heard this morning.

12:46

Meeting suspended until 14:40 and continued in private thereafter until 15:39.

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