OFFICIAL REPORT
AITHISG OIFIGEIL

Environment, Climate Change and Land Reform Committee

Tuesday 20 November 2018

Session 5

The Scottish Parliament
Pàrlamaid na h-Alba

Tuesday 20 November 2018

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ENVIRONMENT, CLIMATE CHANGE AND LAND REFORM COMMITTEE
34th Meeting 2018, 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)
*Rhoda Grant (Highlands and Islands) (Lab)
*Richard Lyle (Uddingston and Bellshill) (SNP)
*Angus MacDonald (Falkirk East) (SNP)
*Mark Ruskell (Mid Scotland and Fife) (Green)
*Stewart Stevenson (Banffshire and Buchan Coast) (SNP)

*attended

THE FOLLOWING ALSO PARTICIPATED:

Teresa Anderson (Action Aid International)
Dr Diana Casey (Mineral Products Association)
Jim Densham (Scottish Environment LINK)
Gina Hanrahan (WWF Scotland)
Professor Tahseen Jafry (Centre for Climate Justice)
Professor Paul Jowitt (Heriot-Watt University)
Elizabeth Leighton (Existing Homes Alliance Scotland)
Fabrice Leveque (Scottish Renewables)
Alan Munro (Young Friends of the Earth Scotland)
Siri Pantzar (2050 Climate Group)
Caroline Rance (Friends of the Earth Scotland)
Will Webster (Oil & Gas UK)

CLERK TO THE COMMITTEE

Lynn Tullis

LOCATION

The Robert Burns Room (CR1)

Scottish Parliament

Environment, Climate Change and Land Reform Committee

Tuesday 20 November 2018

[The Convener opened the meeting at 09:30]

Decision on Taking Business in Private

The Convener (Gillian Martin): Good morning and welcome to the 34th meeting in 2018 of the Environment, Climate Change and Land Reform Committee. I remind everyone to switch off their mobile phones, as they might affect the broadcasting system.

Agenda item 1 is a decision on taking business in private. Are members content to take agenda item 3 in private?

Members *indicated agreement.*

Climate Change (Emissions Reduction Targets) (Scotland) Bill: Stage 1

09:30

The Convener: Under agenda item 2, the committee will take evidence on the Climate Change (Emissions Reduction Targets) (Scotland) Bill. This is the sixth of the committee's evidence sessions with stakeholders.

I am delighted to welcome our first panel this morning. Teresa Anderson is policy and communications officer on climate and resilience with Action Aid International; Jim Densham is senior land use policy officer with the RSPB Scotland, and is representing Scottish Environment LINK; Gina Hanrahan is head of policy at WWF Scotland; Professor Tahseen Jafry is the director of the centre for climate justice; Alan Munro is a member of Young Friends of the Earth Scotland; Siri Pantzar is policy operational volunteer with the 2050 climate group; and Caroline Rance is climate campaigner with Friends of the Earth Scotland.

There will be a lot of questions that all of you may think that you have something to say about. In order to manage our time, I have asked members to direct their questions to individuals. Do not think that you have to answer every question; we will run out of time if you do that. We are going to be efficient and targeted.

I will open up the questioning with a question about the bill, the Paris agreement and the Intergovernmental Panel on Climate Change's recent report. Perhaps all of you can answer this question briefly. Is the bill adequate in terms of compliance with the Paris agreement and the recent IPCC report?

Caroline Rance (Friends of the Earth Scotland): The Paris agreement commits all nations to holding the increase in local temperature rise to well below 2°C above pre-industrial levels and to pursuing efforts to limit that to 1.5°C. The IPCC report, which came out just a few weeks ago, made the pathway that we need to be on to meet those targets very clear, and it talked about the need for urgent and rapid transformational change.

On the targets in the Climate Change (Emissions Reduction Targets) (Scotland) Bill, as introduced, we have particular concern about the pathway to 2030, which has not significantly changed from the pathway that was set out in the Climate Change (Scotland) Act 2009. Obviously, the targets in the 2009 act were set more than nine years ago and, at that time, we assumed that

a global deal would be made in Copenhagen that would limit the temperature rise. That failed to happen, of course. When we set those targets, we had not yet breached a 1°C temperature rise. It is quite inconceivable to think that a pathway that we set in those circumstances more than nine years ago remains consistent with the significant increase in ambition under the Paris agreement.

The First Minister has spoken very clearly about the need for Scotland to play our full part in delivering the Paris agreement but, unfortunately, with the targets that have been brought forward, the bill will not deliver it.

Teresa Anderson (Action Aid International): The IPCC gave us a lot of new, very clear information that we really need to take to heart. If we take seriously the mission to limit the increase in warming to 1.5°C and to avert runaway climate change, we really need to listen to the science from the IPCC, which has told us that we will pretty much use up the carbon budget for 1.5°C within 12 years unless we take absolutely radical transformation action right now. There is no avoiding that—the science is very clear.

I recognise that the bill was drafted before the IPCC report came out, but if you are serious in asking the question of yourselves, for the sake of Scotland and the world you need to understand what that will mean and acknowledge that the bill is not strong enough in a number of ways. We are talking about a 12-year timeline and having a net zero target by 2050, but 2050 is almost irrelevant if we use up the budget within 12 years. We need a much steeper curve of emissions reduction in the near term rather than focusing on the long-term target.

The Convener: It is not enough just to set targets; we need to achieve the targets. Are the pathways clear enough in the bill, or will setting targets force everything else to happen? We have heard views on that question over the past few weeks. We do not want to set targets that we will fail to reach, because we want to be a world leader on the issue. If we fail, the message will be that the targets are unachievable. What are your views on that?

Teresa Anderson: We are treating something that is so important as an existential crisis. It is better to set high targets that force us to achieve more than to set achievable targets that could lead to planetary breakdown. Failure to meet a political goal is less of a disaster than failure to meet climate targets.

Stewart Stevenson (Banffshire and Buchan Coast) (SNP): I want to pick up on the word "science", which I think that both Caroline Rance and Teresa Anderson used. The IPCC report is a review of the science. Who should choose the numbers in the targets? Should it be politicians or scientists?

Caroline Rance: It is pretty clear that our targets should be based on what climate science and climate justice demand as being Scotland's fair and equitable contribution to our legal international obligations under the Paris agreement and the United Nations Framework Convention on Climate Change. How we implement those targets is a political decision, which should be based on what is right for Scotland.

Stewart Stevenson: I understand perfectly the definition of climate science. However, climate justice, which I know about from looking at the work of the Mary Robinson Foundation, is not a science-based observation but a moral observation—which I support, by the way. Is that a correct interpretation?

Caroline Rance: Climate justice is about ensuring that we acknowledge our historical responsibilities, which is an important point to take into account whenever we look at the targets. The Paris agreement does not set out only the temperature goals. Article 2.1 sets out those goals, and article 2.2 says:

"This Agreement will be implemented to reflect equity".

Climate justice is an important consideration that is embedded in the heart of the Paris agreement, so it is fundamental that we consider climate justice when we apportion the global carbon budget in order to come up with our targets.

Siri Pantzar (2050 Climate Group): On the one hand, we are looking at international equity and justice, and, on the other, we are looking at intergenerational equity and justice. As we have discussed, if we run out of our carbon budget after 12 years—or a bit longer, if we manage to expand our ambition—it will be much more difficult for those of us who will be dealing with the issue in 2030 or 2040 if we have no budget to balance. It will be much more just and productive to make the change at this point, when we have a bit of wriggle room and a bit of space for a managed transition, rather than in 2030 or 2040. We might not have that budget then, so our options would be different.

Gina Hanrahan (WWF Scotland): I go back, if I may, to the convener's first question, which was whether the bill is adequate in terms of delivering on the Paris agreement.

One of the fundamental questions that needs to be answered about the bill is what temperature target it is aiming for. There has not yet been enough clarity about that from the Scottish Government. The IPCC report lays bare the stark difference in effects between 1.5°C and 2°C. If we

go for 2°C, 60 million more people would be exposed to severe drought and 1.3 billion more people would be exposed to extreme heat waves. It would mean an ice-free Arctic ocean once every 10 years as opposed to once every 100 years. It would also mean that we would lose virtually all our coral reefs, whereas with a 1.5°C target, we have a chance of saving up to 30 per cent. Losing coral reefs is obviously a fundamental problem in itself, but the reefs are also an ecosystem on which 1 billion people depend. From our perspective, the bill needs to aim for the 1.5°C target.

It is clear from the IPCC report that the globe as a whole needs to aim for net zero carbon roughly in the 2050 range. As we have been told, that is the target that the bill is aiming for: 90 per cent equals carbon neutrality. However, that would place Scotland only at the global average effort by 2050, which would not do enough to tackle the equity dimension. It would also not do enough to acknowledge Scotland's huge economic potential from our vast renewable resources and vast carbon storage potential. If we cannot do this, I do not see which other country can do it. We would like the bill to set iconic long-term targets to eliminate our contribution to climate change entirely by 2050, and stronger early action.

We could spend quite a bit of time exploring the feasibility question, if the committee is interested in that. The bill has set a 90 per cent target because the United Kingdom Committee on Climate Change, when it produced its advice in 2017, said that that was at the limits of feasibility. That was based on 2015 advice developed for the fifth carbon budget at the UK level. There is a really exciting global conversation happening now about net zero and 1.5°C, stimulated by the Paris agreement, which means that a plethora of new research is being produced that tackles the feasibility question.

Yesterday, for instance, new evidence came through from the Energy Transitions Commission, which is led by Adair Turner, the former chair of the CCC, and involves lots of oil and gas majors. It shows that we can make huge progress towards net zero in the industrial, hard-to-treat sectors. Pathways have been developed at the European level by the European Climate Foundation. There has been new evidence on the potential for negative emissions from the Royal Academy of Engineering and a number of other sources, including some Scottish academics.

The Convener: My colleagues will address the feasibility question later, so we will have ample opportunity to discuss that. Professor Jafry wanted to say something in response to the first question.

Professor Tahseen Jafry (Centre for Climate Justice): I echo what my colleagues have said, and what the IPCC report says. The headline that everyone talks about is that every extra bit of warming matters. In that context, there are challenges in going from 1.5°C to 2°C, not just for our ecosystems but for society, in terms of human health and wellbeing, and the achievement of the UN's sustainable development goals. In particular, there is the difference that it will make to the risk of droughts, food shortages, floods and heat-related deaths. It is important to bear in mind the implications of 2°C for people living in the global south, the Arctic regions and the most challenging and vulnerable parts of the world.

I want to pick up on the point about climate science, and whether climate justice is a science. We very much advocate consideration of the impact that small temperature hikes will have on society as a whole. We need to build an evidence base around that—the difference that such hikes will make to people's livelihoods and the implications for society's ability to build resilience and live sustainably. It is important that we build on the evidence, get that right and drill right down into the human aspects. We need to consider the implications of not reducing our carbon emissions and not reaching our targets. I feel that there is still a bit of a gap there—it is a bit of an unknown.

The Convener: You are talking about how not reducing our carbon emissions would impact on individuals.

Professor Jafry: Yes.

09:45

Jim Densham (Scottish Environment LINK): I want to talk about the impacts on wildlife. We cannot afford to look at some of the pathways and think that we can have an overshoot—that is, we go beyond 1.5°C and then come back to it through sequestration and the removal of carbon from the atmosphere. Wildlife is already being seriously affected. We are not talking about a future threat; this is a threat that is happening right now and is affecting many species, even in Scotland. We used to say that 2°C was safe warming, but we have a great deal more science now, as well as the Intergovernmental Panel on Climate Change report, and we can see that we need to stick to 1.5°C and not go beyond it. If we come back from beyond 1.5°C, it might be fine for humans, but it will have serious impacts for a lot of wildlife.

The United Kingdom Committee on Climate Change talked about the need for us to have emissions reductions of around 89 to 97 per cent by 2050 in order for us to return to 1.5°C. We need to ensure that we do not go beyond 1.5°C. Many of us in the wildlife non-governmental organisations want to ensure that we have net

zero emissions by 2050 in order to avoid that catastrophic prospect for many species.

Of course, the implications for people are catastrophic as well. The IPCC report says that 20 to 40 per cent of people now live in a 1.5°C location—we are not talking about a world where everywhere is warming by more than 1.5°C; we are talking about hot spots and cold spots. We are quite fortunate here in that we have only 1°C of warming, although the North Sea is warming by 2°C. There are differences all over the place, and we need to ensure that the world is safe for wildlife and people.

Mark Ruskell (Mid Scotland and Fife) (Green): The difference between 1.5°C and 2°C is interesting. This committee has not really covered what implicit target is in the bill with regard to global temperature and Scotland's contribution to that. The IPCC took a global view of the impacts. Has there been any analysis of what that means for Scotland?

Jim Densham: I do not think that there has been any analysis of what the difference between 1.5°C and 2°C means for Scotland.

Mark Ruskell: Do we have any species that would be threatened by such warming? Might we see an increasing refugee crisis in Europe?

Jim Densham: There are many species that are already experiencing the impacts of climate change—we set some of that out in the evidence that we provided. I mentioned that the North Sea is warming by 2°C. That has affected the marine food chain quite a lot. The sand eel story is quite well known. In the North Sea, the food chain starts with the phytoplankton, which the zooplankton—the copepods and the other small plankton—feed on. However, those cold-water plankton are vulnerable to temperature changes and we have found that they have moved north and have been replaced by warmer-water plankton that are not as nutritious, which means that the sand eels that feed on them cannot thrive and their numbers reduce, which has an impact on our sea birds. Sand eels are a key species for kittiwakes and puffins, and we have already seen a 60 per cent reduction in Scotland's kittiwakes, even without massive amounts of climate change—in areas such as Orkney and Shetland, there has been an 80 per cent reduction. The warming of the sea is affecting us right now, and we are likely to see whole colonies being wiped out.

The Convener: We will move to questions from Finlay Carson. Everyone will have ample opportunity to make points that they have not had a chance to make so far.

Finlay Carson (Galloway and West Dumfries) (Con): The bill will amend only those parts of the Climate Change (Scotland) Act 2009 that relate to emissions reduction targets and associated reporting duties. The consultation focused on the strategic ambition and not delivery mechanisms. Is it realistic that we should consider increased target setting without also considering what will be required to meet the targets?

Professor Jafry: Target setting is important, but I also recognise the importance of thinking about our infrastructure and what is needed to enable us to achieve those targets.

We have just finished for the Scottish Government the Arctic mapping report, which looks at moving away from oil and gas exploration towards decommissioning and the benefits of renewable energy. The Scottish Government has an opportunity to step into that zone and demonstrate global leadership, but there are also huge opportunities for the economy in terms of jobs if people get behind the development of the infrastructure for renewable energy technology. In any case, whether it happens through the jobs market, technology and innovation or the partnerships and links that are built with other organisations, we need to ensure that this is at the heart and core of what we stand for. It is critical that we bring all of these things together.

Siri Pantzar: Whether the investment in innovation and infrastructure comes from business or the public sector, it will still follow the setting of ambitious targets and predictable policy. The direction of movement needs to be clearly set out not only for the public sector but for small to medium-sized enterprises, other businesses and, indeed, the people of Scotland—for example, young people trying to decide what they want to study and looking at the direction in which society is going. It is important to focus on how we achieve targets, but having the targets in the first place will open up the solution-making process to all of Scottish society, where there is a lot of creativity and innovation capacity both within and outwith the public sector.

Gina Hanrahan: The bill presents a huge opportunity to align targets with the sectoral policy effort that is needed to deliver them. I suppose that the Climate Change (Scotland) Act 2009 set a precedent in the way that it covered many sectoral policy areas, and Stop Climate Chaos Scotland, which several of us around the table are members of, has been calling for a number of sectoral policies to be enshrined in the new legislation. For example, it is asking for action to be taken in our building sector through the setting of an energy performance certificate standard of C by 2025 or 2030, which perhaps the committee can explore with the Existing Homes Alliance Scotland in the next evidence session; for fossil-fuel vehicles to be phased out by 2030; and for a nitrogen budget to be set for the agriculture sector. Those are our

policy areas, but we would argue that they all fall within the scope of the bill, because they are about setting emissions targets for those specific sectors.

Another interesting question is how the bill deals with investment and the budget. We would like it to tidy up some of the provisions around the budget, particularly with regard to section 94 reporting, to ensure that we report on the change in emissions instead of the emissions in any given year. We also want the bill to ensure that there is a low-carbon element to the infrastructure commission, because we need to get our capital investment right for the future. Finally, we want the new budgetary process to be aligned with the monitoring process for the climate change plan. The bill presents opportunities that the committee should consider.

Teresa Anderson: I would also remind members of the lesson to be drawn from the development of renewables, which have far outperformed what was projected for them in terms of scale, pricing, feasibility and so on. If people had planned things on the basis of what they thought that renewables were going to do, they would have very much underestimated their potential. That is a really strong lesson for us, because we need to remember that political feasibility changes once you change the politics. You cannot define everything on the basis of what is considered to be politically feasible at a particular time. If ever there was going to be a time for a bill to take a leap of faith, this would be the time.

Caroline Rance: Staying with that theme of learning lessons from the past, I think that we should remember what happened with the 2009 act. The target of a 42 per cent reduction in emissions by 2020 was set not because we knew exactly how it would be met but because it was the right one based on climate science and Scotland's contribution to tackling climate change. In fact, the first report on proposals and policies, which was published in 2011, did not set out the entire pathway to meeting that target. Now we are well on course to exceeding it.

Rhoda Grant (Highlands and Islands) (Lab): We have heard why we, as a developed country, have to take on a larger share of responsibility, and we all agree that there has to be transformational change. The committee heard evidence at earlier sessions on how that impacts on different people. For example, people in rural areas people might not have access to public transport and might live in old draughty houses that are hard to insulate. The reasonably well off will be able to afford electric cars, photovoltaics to charge them and good insulation.

When using a carrot-and-stick approach to change behaviour, how do we make sure that we are not penalising people who do not have the wherewithal to do anything about it?

Professor Jafry: We need to develop a policy that has ensuring social justice and equality at its heart. With a changing climate, it is inevitable that the poorest will suffer the most. Those who are already able to adapt to the environment will channel their way out of the situation. With behavioural and societal change, expectations can be unmanageable. We need to be realistic about how to achieve behavioural change in society and make sure that there are structures and resources in place to support those who are in the most vulnerable situations. They also need to be part of the conversation.

On temperature change, the opening up of the Arctic oceans will have significant implications for people in Scotland, particularly those who live in rural and remote communities in the Highlands and Islands. That presents opportunities, challenges and risks. We need to bear in mind that those are the areas where much of the impact will be as a result of the geopolitical governance of the opening up of the Arctic seas.

Gina Hanrahan: An interesting element in the 2009 act is the provision for the CCC to give advice on targets. It is required to balance a number of different factors, including the top-down science and the economics. There are backstops in the existing legislation to ensure that, for example, rural and island communities and connectivity are considered, and that we do not leave anyone behind in the transition. Balancing all those important factors is to the forefront of minds when the CCC advises on targets.

The CCC does not have the same criteria to consider when thinking about policy effort. That might be something to look at for the bill. Is there a role for the CCC in giving stronger policy advice to the Scottish Government that considers those factors in more depth?

Stewart Stevenson: I want to go back to Caroline Rance's point about the 2009 act, which I took through Parliament.

If I recall correctly, the United Kingdom Committee on Climate Change recommended a 34 per cent target and said that 42 per cent was at the limits of practicality. That was the phrase then used, which is exactly the same phrase as is being used about 90 per cent. Is my recollection wrong?

Caroline Rance: I was not around at the time of the 2009 act, but I believe that it was the case that the 42 per cent target was put forward on the assumption that higher targets would come through from other countries, including from the European Union. That did not happen.

In any case, whether 42 per cent was thought to be the limit of feasibility at the time, we have clearly shown in the nine years since that target was set that setting strong targets has driven the technological and social change that has led to the cutting of emissions by almost half.

10:00

The Convener: We will move on to some questions from Angus MacDonald.

Angus MacDonald (Falkirk East) (SNP): I have two quick questions. We know that the Scottish Government consulted on the bill over the summer of 2017, and we know what the main themes of the consultation were. Are the results of the consultation adequately reflected in the bill? Many of the respondents to the consultation stated that the bill should set a net zero target. Should a net zero target and other matters, such as the delivery of the target and the establishment of a just transition commission, have been consulted on?

Jim Densham: Analysis that we did of the responses to the consultation showed that 99 per cent of the people who responded—someone else will correct me if that is not right—wanted a net zero target to be set. You cannot get a much stronger response than that—unless, of course, you get 100 per cent. Why does the bill not include a target of achieving net zero emissions by 2050? It is clear that it should do.

Siri Pantzar: I agree with Jim Densham. A net zero target was called for in the consultation, and it is clear that the Scottish public are keen to drive that forward. Such a target would be a powerful image that would make it clear to the public that we are talking about transformational change. A target of a 90 per cent reduction leaves a little bit of space, which allows everybody to think that they do not have to change by quite as much. A net zero target would serve as a clear image for the public and would let all sectors know that they needed to look at what work they were doing. There is a public drive for having a net zero target.

Professor Jafry: I want to pick up on the reference to a just transition commission. As someone who works in the university sector, I have not seen much on what that commission would be about and what it would involve. I have asked for advice on some of the things that it could consider. I think that there is a huge overlap between the targets to do with achieving a just transition and the targets to do with achieving a climate-just world. The overlap between the two is a grey area. Much remains unknown about that shady area. There are some challenging and difficult questions to do with the possibility of people losing their jobs and being redeployed, and there are sectoral implications for infrastructure and so on. I would welcome a conversation that would unpack those issues in much more detail.

Caroline Rance: I have a point to make about the just transition commission proposal, which ties in with Rhoda Grant's question about how we make sure that the transition to a low-carbon economy is fair to everyone in Scotland. At the heart of the issue is the idea that, as we make that inevitable transition, we must ensure that it does not damage workers and communities that are currently dependent on high-carbon industries.

Friends of the Earth Scotland is a member of the just transition partnership, and we strongly believe that a just transition commission should be established in legislation and that it should be there for the long term. We will need the commission to advise us for as long as it takes us to make the transition, because the challenges will change over time. It is a case of ensuring that the right people—the people who are impacted—are at the table and have a say in how we make that transition, and that they help us to go in the right direction and to choose the right policies.

Angus MacDonald: That was helpful.

Mark Ruskell: I have a follow-up question. I am interested in your views on the role of oil and gas in the Scottish Government's plans and the target. Do you think that oil and gas have a future in 2050? Oil & Gas UK has told us that oil and gas will be meeting 67 per cent of our energy demands in 2050. Is that implicit in the Scottish Government's targets?

Gina Hanrahan: The 2009 act as it is currently designed is primarily about production emissions rather than consumption emissions. We count oil and gas sector emissions, particularly as they apply to refining, and what gets burnt in transport and other sectors. A lot of evidence has emerged over recent years that shows that we can completely decarbonise the energy sectors in particular. We have already made enormous progress on electricity in that respect, the transition is accelerating in transport at an enormous pace, and there is clarity that we can now push on with electrification, particularly in the heat sector.

By 2050, the demand for oil and gas products will be significantly reduced. I do not have a figure for what that will look like, but obviously it is something to test. However, there will clearly need to be a recognition that the sector must have a managed decline. The just transition commission will play an extremely important role in that context.

The Convener: How important is carbon capture and storage in the mix? Everything that I read seems to say that it is an essential part of the

solution, but we had the situation in which UK Government funding for CCS projects was taken away.

Teresa Anderson: I remember when the UK Government decided that, instead of investing in emission reductions, it would invest its climate change budget in CCS. That was about nine years ago, but we have had very little to show for it. Hundreds of millions or billions of pounds have been invested in CCS, but there is nothing to show for it. It breaks my heart to think of all the emissions reductions and climate action that could have happened in that time instead of the pathway that was chosen. The UK Government has made the right choice now to dial back a bit from that CCS investment, but we still keep hearing about this imaginary, magical future technology, which everybody else doubts will be able to deliver anything like on the scale that some parties promise.

The Convener: Maybe the problem is that the funding was taken away from CCS at a crucial point. Stewart Stevenson will know very well that a project in his constituency was very close to winning a bid at that time.

Teresa Anderson: It is not only the technology that has limits; it is the scale. Even if the technical barriers are overcome, the scale of storage potential is still very limited. A lot of proponents believe that bio-energy with carbon capture and storage—BECCS—would be able to increase the potential, but that has massive socioeconomic costs because it would lead to conflict over land use.

Gina Hanrahan: In the conversation that took place around the Peterhead project, the focus was very much on a power sector model for CCS. The power sector has massively evolved in recent years and we now know that we do not particularly need CCS to decarbonise the power sector. However, there might be a role for CCS in the future in the hard-to-treat sectors, particularly the industrial sector. The debate is rightly focused there at this stage.

There are big questions about the role of bio-energy plus CCS in the future. We need to be absolutely clear that we are not going to use a conversation about the development of BECCS to delay doing what we know how to do now. That is the plea that I would make to the committee.

Jim Densham: The IPPC's 1.5° report that was recently released talks about BECCS and CCS being uncertain and entailing "clear risks". The technologies have not been developed enough, which is perhaps a failure of investment and understanding. We are concerned about talk of BECCS models on a massive global scale, because they would have clear land-use change impacts and knock-on biodiversity impacts.

It is the same for Scotland. If we are going to use a lot of our land for bio-energy crops, then burn them, capture that carbon and put it underground, we have to think about the impacts of that on wildlife, society and livelihoods. If we do not want to have a bad impact on our wildlife and our rural communities, we need to do all the things that we can do now rather than rely on a future technology.

Stewart Stevenson: I want to ask Teresa Anderson where she got the statement that we had limited carbon storage capacity. My understanding is that we have hundreds of years' worth of storage in the North Sea for all the carbonic acid that we could possibly produce from everything in Scotland. It might be that what I am hearing is a more global statement. I just want to be clear about what was meant.

Teresa Anderson: You are quite right. I am looking at the global picture.

Stewart Stevenson: Thank you.

Mark Ruskell: Perhaps we could hear a view from each panel member, if that would be all right, convener. I want to come back to the question of there being a net zero carbon target or a net zero greenhouse gas emissions target. When should it be set? Should it be in the bill? Do we have clarity about the pathways to get there, and does that matter? When should a net zero greenhouse gas emissions target be set for?

Caroline Rance: First, we should clarify what we mean by net zero emissions. We have heard people referring to net zero carbon, to net zero carbon dioxide and to net zero greenhouse gas emissions. It is important to clarify that the bill sets out clearly what is meant by "net zero" in the Scottish context: it is a 100 per cent emissions reduction for all greenhouse gases. There has been a bit of unhelpful confusion through use of the term "carbon".

Friends of the Earth Scotland has taken a very heavy equity steer on the targets that we are considering for the bill. We have used the fairshares methodology that was drawn up by the Stockholm Environment Institute. That methodology's premise is that we can burn a finite amount of greenhouse gases to stay well below 2°C or 1.5°C. That is the carbon budget. To apportion the carbon budget, fairshares looks at two things: our historical responsibility or our cumulative contribution to climate change over the years, and at the capability of different countries in terms of finance and technology. The methodology comes up with a net zero emissions target for Scotland in the range of years from 2036 to 2041.

Friends of the Earth Scotland supports a target date of 2040.

We also believe that the most important target in the bill is the 2030 target. Using fairshares, that will mean a reduction of at least 77 per cent by 2030.

Siri Pantzar: The 2050 Climate Group is a membership organisation: we have not set a specific target figure in our consultation of our members. We consulted more than 75 young people when we were looking into our consultation response, and we had support for the net zero emissions by 2050 and net zero emissions by 2040 targets.

The crucial point for us is that the target needs to be in the bill so that the signal that there must be transformational change comes out from it loud and clear. Also, similar to the way in which the Paris agreement works, it is important that the bill contains clear mechanisms for raising ambition, and that we bring the target forward as we see more pathways becoming clear.

Alan Munro (Young Friends of the Earth Scotland): I represent a membership organisation that has not had specific conversations about the actual date at which we would like to reach net zero emissions, but we would, obviously, support a target that is based on Scotland achieving its fair share of global emissions reductions as soon as possible. We support Friends of the Earth Scotland's analysis using fairshares, which calls for net zero emissions by 2040.

As young people, we see the 2030 target as being the most important for us. As things stand, the 2030 target is no more ambitious than what is in the current legislation, which we see as the Government failing to acknowledge the crisis that we are in. That is, effectively, passing on the burden for the more radical transformative action to young people: we will have to address it in the future if you do not address it now.

We are disappointed to see that a linear gradualist approach to emissions reduction targets has been taken—instead of setting a target to immediately reduce a higher percentage of emissions—with the net zero target being addressed later.

10:15

Professor Jafry: My rationale is based on objectivity more than anything else. Realism comes into play, but there is a huge opportunity for the Scottish Government to be very ambitious and to set a net zero target for 2040. We have the knowledge, the skills, the technology and the know-how to allow us to get there and to set a realistic target based on what can be achieved and delivered, underpinned by a robust plan. That plan needs to have community engagement at its core, and to have issues related to the economy, governance and society framing it. We need to be very ambitious and bold, but we must also be realistic and have a very clear step plan on how to achieve the target.

Gina Hanrahan: WWF Scotland supports the target of net zero emissions by 2050 at the latest. We think that legislating for the target will have an important effect on communities, citizens and businesses, and that it signals that we need to innovate and to change cultural and economic practices.

I will be honest; our position is already a compromise, because we need to balance the scientific argument, which is clear that we need to hit net zero as soon as possible, against what we knew at the time about the feasibility evidence, which showed that there was no clear pathway before 2050. As I said, a lot of new evidence has since been made available, but I emphasise to the committee that WWF supports the target of net zero emissions by 2050 at the latest.

We have since produced, with Vivid Economics, work at UK level that will be published tomorrow, that looks at the earliest possible date for a net zero target. It takes a primarily technology-focused view and shows that the UK as a whole can hit net zero by 2045 under some scenarios. There is a clear possibility that Scotland can go further, so we will also commission Scotland-specific analysis.

Jim Densham: As others would, Scottish Environment LINK would like to see net zero greenhouse gas emissions by 2050, at the latest. It is interesting that in its programme for government the Scottish Government talks about net zero CO_2 by that date, so there is a question about non-CO_2 emissions, which seems to be the aspect with which the Government does not know how to deal. Those emissions mainly come from farming and land use, so what is the pathway for them?

On pathways, RSPB Scotland has this week published a report called "Balancing Act: How farming can support a net-zero emission target in Scotland", which asks how we will address non-CO_2 emissions from farming and land use. As the title says, it is a balancing act: it is about reducing emissions through efficiency savings as far as possible—which the committee heard a lot about in last week's session about agriculture—and about boosting the massive potential that we have in Scotland for sequestration through peatland restoration, tree planting, blue carbon and many other things, including habitats. The scientific papers that are quoted in the report state that we have massive potential to do that in Scotland.

It can be hard to see the pathways ahead. The IPCC report says that we need "rapid and far-reaching" transition, that it be unprecedented in scale but not in speed. That struck me: we need to do it on a massive and unprecedented scale—across the globe and across Scotland—that is not, however, unprecedented in speed. We have done things very fast before and we can make the change quickly. If we get on with it and take steps now, as the Committee on Climate Change's "Land use: Reducing emissions and preparing for climate change" report that came out last week says, we can do that.

Teresa Anderson: Action Aid uses the Stockholm Environment Institute methodology that has been used by Friends of the Earth. I strongly encourage the committee, if it has the chance, to look at the online equity reference calculator to see what different countries' fair shares, which take into account historic per capita emissions, would be. It is a very interesting tool: the institute has taken the global carbon budget and figured out what each country's fair share should be.

On that basis, we agree with the analysis that 77 per cent reductions by 2030 and net zero by 2040 would be in line with the fairshares approach, and that all greenhouse gases should be looked at, including non-CO_2 gases.

We should bear in mind the point about the steeper curve, which is absolutely critical. The 2030 target is the key issue. The graphs in the Intergovernmental Panel on Climate Change's special report "Emissions Scenarios" are very clear, and scenario 1 is especially clear. If you look at the scenarios, you will see that the first scenario is the socially hopeful one for which we all want to reach. That curve is much steeper, and it does not rely on future technologies that have not yet been invented to solve the problem. If we want to keep in line with the IPCC, that steeper curve is critical. The focus should really be on the 2030 target, with 2040 as the net zero emissions point.

Angus MacDonald: I want to pick up on Jim Densham's point and the submission from Scottish Environment LINK. I was interested to see in that submission a call to

"Establish a duty for a 'sunset clause' for peat extraction in Scotland".

Peatland restoration has been mentioned. Will Jim Densham expand on that suggestion?

Jim Densham: We have really good targets for peatland restoration in the climate change plan, but the plan is about protection. A sunset clause would relate to areas of land on which consent for extraction of peat has been given. Peat extraction is totally damaging because it releases lots of carbon. Obviously, peat helps people to grow plants, but there are many alternatives. There are many consents out there that companies have been sitting on for many years, of which a vast proportion have not been turned into permissions to extract; they are consents to extract at some point in the future.

We want a sunset clause with a date by which people will need to have stated that they will or will not remove peat, because we believe that many consents will never be removed, but extraction will never happen. If we were to be clear about how much peat would be removed in the future, we could think about how to recompense companies not to extract, and we would be much more certain about how much extraction there will be. If we used that as a way in which to educate people that the practice is very damaging, and that we should not use peat for our horticulture, it would reduce people's desire to buy the product and, I hope, reduce future extraction. That is a very practical suggestion.

The Convener: I am conscious of the time. Questions and answers should be kept short.

Claudia Beamish (South Scotland) (Lab): I say for the record that I lodged a stage 2 amendment to the planning bill to that effect, and I understand that the Minister for Local Government, Housing and Planning is prepared to work on that to make it better for stage 3.

Stewart Stevenson: What bill was it?

Claudia Beamish: It was the Planning (Scotland) Bill. I hope that I said "planning", because I am a bit obsessed with climate.

I want to go back to Jim Densham. Will you briefly explain to us the open letter on setting targets from farmers and Scottish Environment LINK? The group of signatories is significant and broad. The answer will lead me on to my main question, which is on the significance and importance of the interim targets, for anyone who has not yet spoken about them.

Jim Densham: Agriculture, farming and land use have been seen as quite hard areas in which to reduce emissions. The Government set only a 9 per cent reduction envelope for agriculture in the climate change plan. We believe that that is neither sufficient to move the sector forward nor is it fair, so we drew together people who were keen that we do more, and that the Government provide leadership, to suggest measures that they want. There were 50 signatories to the letter, which called for carbon-neutral farming. We referred to "carbon-neutral farming" so that people would understand the letter, but it is really about greenhouse-gas-neutral farming.

As I said, 50 organisations and individuals, including non-governmental organisations, farming

organisations, farmers, academics and other rural groups that were interested signed the letter. People were a bit mixed up on the actual target that we were aiming for, which was a net zero target, but we felt that the most important thing was that those people were keen on the measures that we were talking about. They include, as our submission sets out, better soil management, agroforestry, reducing emissions intensity, helping farmers to become more efficient and much better provision of advice.

I suggest that the committee looks at the evidence from Scottish Environment LINK to be absolutely clear what we were calling for, but there were four measures that the organisations that signed the letter were keen be delivered.

Claudia Beamish: Perhaps I should ask for brief answers so that we can get through all our other questions. Can Scottish Environment LINK and other panel members tell me how the interim targets relate to what the IPCC has said on the need for urgent and rapid transformational change?

Jim Densham: There is a lot of evidence and advice out there on the need for rapid transformational change. We want a target of a 77 per cent reduction by 2030, because if we continue on our current trajectory before we act, we will just allow the status quo to continue as we wait for someone else to act. We need to put in place today or tomorrow the things that we need to do.

Claudia Beamish: Are the things that you have proposed realistic at the moment? You do not need to go into detail—a simple yes, no or maybe will suit us fine.

Jim Densham: Absolutely. In its report "Balancing Act: How farming can support a net-zero emission target in Scotland", RSPB Scotland makes 10 suggestions for things to be done in the long term—

Claudia Beamish: I am sorry, but I was talking about the interim targets. Just for clarity, can anything be done now in that respect?

Jim Densham: Absolutely. The report sets out 10 recommendations for improving the climate change plan, which would help us to achieve a 9 per cent reduction and then take things further, and makes 10 other very serious suggestions for taking us much further than the 9 per cent target. It sets out a much faster trajectory for how agriculture can help to achieve a 77 per cent reduction in emissions by 2030.

Claudia Beamish: Does anyone else want to come in?

Gina Hanrahan: Perhaps I can explain how we arrived at our ask of a 77 per cent reduction by 2030. There is a needs-based case and a feasibility case for it. With regard to the former, we have based our analysis on the carbon law principle that was developed by Johan Rockström at the Stockholm Resilience Centre and which relies on our halving emissions every decade, as the science tells us we need to do.

On the feasibility case for the 77 per cent target, the fact is that we definitely can get significantly further than the 66 per cent that has already been legislated for: indeed, the Government itself has shown that 71 per cent is a point on the linear trajectory through to net zero by 2050, and in analysing scenarios for the climate change plan that have been published by the Committee on Climate Change and by the Government, and looking at ambitious but credible envelopes within them for specific sectors, we have found that we can easily reach a 73 per cent target by 2032 if we take credible and realistic action. Indeed, in a stretch scenario, we could even get up to 79 per cent—if we do not use the windfall in the land-use sector that the Scottish Government used to backtrack on an ambition in the final climate change plan.

It is important to recognise that in its recent progress report the CCC recognised the need to build in contingency now if we are to meet more stretching targets in the future. Our analysis shows that we can do that and that there are credible policies through which to do it.

Siri Pantzar: My colleagues have responded better than I can to the feasibility question; I am not a technology expert. However, I can say that the setting of credible early targets will allow Scotland to continue along its leadership path and will give it first-mover advantage in building cases for business opportunities and developing the technology of the future.

In addition, I want to highlight that between 2040 and 2050 we will be dealing with adaptation as well as mitigation. The more steps we can take now, while we have the world as we know it, the less we will have to push for radical change at a time when the world will be changing drastically around us.

10:30

Alan Munro: On the 2030 targets, I re-emphasise the moral urgency that I am here to project. The ambition of the action that we take now is more important than ever because, as has been alluded to, our share of the carbon budget is being used up rapidly. Some reports say that we have up to 12 years left before our fairshares contribution to global emissions reduction has been used up. We need to deliver the emissions reduction consistently with what is demanded by

climate science and climate justice. I re-emphasise that young people around the world are already experiencing the impacts of climate change—

The Convener: We are running out of time, and re-emphasis of points that have already been made will eat into our time for other questions. I apologise.

Caroline Rance: In looking ahead at what can be done up until 2030, I reference the climate change plan. The committee spent a great deal of time scrutinising the climate change plan and making thorough recommendations on what could be done to improve it. However, when we saw the final plan earlier this year, we found that the policies in the draft climate change plan that would deliver 1 million tonnes of savings were not in the final climate change plan. There was a rollback in ambition in the final plan from what was in the draft plan. There is a suite of policies that the Scottish Government has already considered and costed, that the CCC has already put forward and which the committee has already scrutinised, that give us significant potential to go further in relation to the targets for 2030.

John Scott (Ayr) (Con): What are the practical implications of the interim targets that you have proposed for 2030, for example? The Scotch Whisky Association said that, if the 2020 target were revised, meeting the new target would not be easily achievable—"not realistic" are the words that it used. In perhaps accepting that what the Scotch Whisky Association has said are fair comments, could you talk about the implications of the 2030 targets? I declare an interest as a farmer.

Teresa Anderson: I go back to the original question on whether the bill matches the IPCC report. If there was one key word to take away from the IPCC report, it would be "urgency". Interim targets are clearly necessary in order to meet the urgency question; 2050 targets would not respond sufficiently to that urgency.

You asked about the implications. As has been said, the land and agricultural sector certainly has a role to play—I say that given that you are a farmer. Agriculture accounts for a significant amount of emissions, particularly non-CO_2 emissions. As has been alluded to, there are savings to be made that could enhance food security and adaptations, particularly through soil management.

Last week's CCC report identified that there is a lot of potential if we consider the role of diets as part of land management. Many reports that have come out in the past months have confirmed that analysis. The role of diets and how we use land management in that context will be a big part of future strategies. A lot of gains can be made in the short term by considering that.

Professor Jafry: Underpinning the question on the practical implications of the target for 2030 is what will be the driving force to achieve the target and to make it practical and realistic. We need to mobilise the private sector very quickly to drive emissions reductions in order to meet the target. On the practicalities of reaching a target, conversations with the private sector are critical, and multi-stakeholder conversations need to happen very quickly in order to get buy-in.

John Scott: Last week, we discussed the implications of driving change by legislation or by incentivisation. What are your preferred options, particularly on land use—an issue that I know a bit about—and in relation to the new agriculture bill that will be introduced for when we leave the common agricultural policy?

Professor Jafry: Legislation can sometimes be seen as being top down, particularly in the land use and farming sectors. People who work in that sector come from different socioeconomic strata. If we are driving change by legislation alone, my recommendation would be that we should get good buy-in to the legislation to support its roll-out.

Siri Pantzar: Legislation is not necessarily something that the committee will want simply to give to the agriculture sector. Building engagement with all groups in the sector, including young people, will be crucial to make sure that there are answers to the questions from people who work with the land. Their questions might be different from the questions from people who do not work with the land. Consultation is key in all of this, and that includes building the sense of urgency.

To pick up on John Scott's question, none of the proposals will be easily achieved. They will be difficult whether they are done now or in the future. There will be difficult choices to be made, but they will be easier to make now than at later stages. None of us thinks that the changes will be easy, but they are necessary.

Jim Densham: As the committee heard at last week's meeting, the voluntary approach in farming has not produced significant emissions reductions so far. We need to build on it. We certainly need to broaden "Farming for a Better Climate". We need to give more advice to farmers, to help them to understand. We need a basic level of regulation in order to bring some farmers up to a minimum level. We have talked before about compulsory soil testing to ensure that the basic planning for fertiliser use is in place and that all farmers are doing that testing.

With any new CAP or post-Brexit system of farm payments, there will need to be conditional

payments. It is not all about regulation. It is about different layers—some basic regulation, conditional and supported payments, and rewarding farmers for sequestration in future so that, if they need to change their land use and have the opportunity to do so, they can be compensated for payments foregone.

John Scott: Should the ability to modify targets in both directions be included in the bill?

The Convener: Could we have short answers to the question? We have a lot of questions still to ask.

Caroline Rance: We discussed that point at length with the bill team, who convened a discussion group on the technical elements of the bill over the winter.

Instinctively, it feels wrong to allow a mechanism for targets to come down in future. We always want to be driving for more ambition to do better and go further. It is part of the proposal for an inventory freeze to protect annual targets from baseline changes and in the inventories. We are content that the mechanism to bring targets down as well as up is insulated within one part of the bill and that there are significant safeguards to ensure that targets could be brought down only with advice and as the result of an inventory change. That could be done only by regulation, which would be brought before the Parliament for scrutiny.

Finlay Carson: Section 5 sets out the target-setting criteria, which include scientific knowledge, technology, energy policy and so on. The criteria have been updated since the 2009 act to include

"current international carbon reporting practice."

Are the target-setting criteria appropriate? Stop Climate Chaos Scotland suggested that there should be a definition for "fair and safe" in

"the objective of not exceeding the fair and safe Scottish emissions budget".

Are the criteria appropriate now?

Caroline Rance: There was a proposal in the consultation to remove the criterion relating to

"the fair and safe Scottish emissions budget"

and we are pleased to see that that objective will be kept in the bill. That is the fundamental, basic, overarching criteria that we should be considering when we set our climate targets.

We are pleased that that is in the bill, but we would like the definition to be strengthened. At present, the definition refers more to the "safe" part of the fair and safe budget; it does not really reflect the "fair" aspect. We think that the UNFCCC principles of equity and common but differentiated responsibilities should be included, and we would like there to be a requirement for the CCC to consider our fair and safe emissions budget when it produces its five-yearly advice and to include it in its calculations.

With regard to whether the target-setting criteria are still relevant, you are right to say that there is quite a long list of criteria. As I said, we consider the fair and safe budget one, the one that considers our obligations under science and the one that concerns the UNFCCC protocols to be the most important, and we consider the ones that come below that to be more about how we implement the policies.

Gina Hanrahan: A criterion that we see as notably missing is one around public health. A lot of other factors are under consideration, but a lot of the policies that tackle climate change have huge co-benefits in terms of public health, which you can see if you think about initiatives such as insulating people's homes, ensuring that homes are free of damp and draughts, encouraging people to cycle and walk instead of using their cars, where appropriate, and reducing air pollution. Those initiatives are as much about avoiding costs to the national health service as anything else, and we need to ensure that the CCC can balance that in its criteria.

Jim Densham: Caroline Rance talked about the first three criteria being the top ones because they are the ones that are important, scientifically speaking. I think that the criterion in section 2B(1)(j) of the 2009 act, which is

"environmental considerations and, in particular, the likely impact of the targets on biodiversity"

should also be a top criterion, because, when we are setting targets, we have to make sure that we do not impact on our wildlife and on wildlife around the globe.

Stewart Stevenson: To ensure that I ask my question in the right context, I want to confirm that we have a shared understanding of what the term "net zero emissions target" means. I think that sections 1 and 15 clearly say that "net zero emissions" means that there will still be emissions, not least because when we speak, we create carbon dioxide. However, earlier, there seemed to be a suggestion that we were looking to bring emissions of each of the seven gases to zero. I see that Gina Hanrahan is shaking her head. Fine—I will move to my question.

In relation to the advice that the CCC gives the Government, and which we all see, how should the word "achievable" be defined? A lot of the debate is anchored in different views of what that word means.

Gina Hanrahan: That is a fundamental question with regard to the bill. The bill gives achievability a

status that it did not have in the previous legislation. Previously, feasibility of technology was one of the criteria that had to be balanced along with a number of other factors, including science and economics, when the CCC was giving advice. In the bill, the only reason why we would set the net zero target is if we know that it is achievable.

What does achievable mean? As Jim Skea made clear in your first evidence session on the bill, the IPCC has six layers with regard to how it considers feasibility, going from the geophysical issues, through the techno-economic issues to the socio-political issues. The really big question about whether something is achievable is whether there is enough political will to put it in place.

The feasibility conversation has moved on considerably; I have already alluded to that. However, I caution against giving it paramount status in the bill.

10:45

Stewart Stevenson: Are we also talking about technical issues? Ten years ago, we thought that tidal energy was one of the big things, but nothing has happened in that area. However, in other areas of electricity generation, we have greatly surpassed the previous situation. Our ability to see the future is pretty limited, so is it important that we also look at technical possibilities?

Gina Hanrahan: Yes. We have to explore the innovation potential for Scotland. We have enormous research expertise here that we would like to see exploited towards a low-carbon transition. A lot of analysis by the CCC to date has centred on the technological feasibility; it has done extensive economic modelling and looked at what the models tell it at any given point in time. However, feasibility is an evolutionary concept, so we cannot capture it at one moment in time for all time. We need to find ways of ensuring that the new pathways that are coming are adequately legislated for. To paraphrase the cabinet secretary, “Show me the pathway and I will legislate for it.” Now, I think—

Stewart Stevenson: Forgive me but, like the convener, I am watching the clock and I know that Caroline Rance wants to come in.

Caroline Rance: You said that the ability to see the future is pretty limited, but the IPCC report very accurately painted a picture of the impacts that we will face if we do not do what is required. The question should be less about what achievable means and more about whether we should use that concept in our target-setting criteria rather than legislate for what is necessary.

Teresa Anderson: The IPCC scenarios looked at what was achievable, but they were not constrained by what was perceived to be politically achievable at the time, which can move very quickly once the politics change. The question of how we define “achievable” is a good one, but I would go with the IPCC model of what is necessary and showing the pathways that could be done if we set our minds to that.

Stewart Stevenson: I will skip the next bullet point, as most of it has been covered, and turn to another issue that has come up. Caroline Rance seemed to indicate that it might be worth considering, in some circumstances, changing targets. The bill moves towards expressing targets in percentages, but the 2009 act expressed targets in tonnes, so re-baselining blew the targets off arithmetically. Does the bill’s move to percentages remove the need to consider reducing targets, because re-baselining will no longer have the effects that it previously had?

Caroline Rance: The problem with the 2009 act was that some targets were expressed in percentage terms and some were expressed in megatonnes. Whenever we changed the baselines, the difference between the targets in megatonnes and the targets in percentages caused a problem.

However, I reiterate that I do not want to see targets coming back down; I always like to see them going up. There will be a mechanism for dealing with any big changes to the measurement science that would require a change to targets.

Gina Hanrahan: We support the move to percentages, but it is important that we still have a view to Scotland’s total emissions. That is where the CCC recommendations on a total, fair and safe cumulative budget continue to be important, and we need an update on that.

Angus MacDonald: We have not touched on carbon credits, but I am keen to hear whether the panel agrees with the Government’s approach to retaining an option to use carbon credits; and to hear its views on the circumstances in which that power might be used—for example, to achieve a net zero target.

Gina Hanrahan: Just to clarify, the bill reverses the position in the 2009 act, so that the default position that we could use credits becomes the default position that we will proactively have to seek to use credits. However, we will still be able to use credits for up to 20 per cent of the planned reduction in any given year.

There is a question over what it would be realistic to expect from carbon credits by 2050, when we will be living in an increasingly carbon-constrained world. Carbon credits will not be floating around extensively, and if they are

available, it will be at an enormous price. It is right that we should seek to push forward as much as possible on domestic action, because carbon credits will not be around in the long term.

There is an interesting question about how flexibility works at a global level in a net zero world. We have scope for carbon storage, afforestation and other things that other countries might not have, but that is different from the carbon credits question.

Caroline Rance: When the bill that became the Climate Change (Scotland) Act 2009 was going through Parliament, we argued against the inclusion of carbon credits. A compromise was proposed that involved imposing a limit on the use of credits, which Friends of the Earth Scotland was reasonably content with.

Jim Densham talked extensively about the great capacity that we have in Scotland for sequestration and for enhancing our carbon sinks. It is highly unlikely that Scotland will need to use credits at all, and the Cabinet Secretary for Environment, Climate Change and Land Reform has said that the Scottish Government does not intend to use them. We are minded to agree that we will not need to use them.

Angus MacDonald: Gina Hanrahan mentioned the 20 per cent limit. I would be keen to hear the panel's view on whether that is a suitable percentage.

Gina Hanrahan: We have not had a conversation about what the appropriate limit is. It is very hard to say what it should be. The principle is that we should exploit all possible domestic action first. It is critical that we do not think about credits in the short term. Credits are a conversation for the long term, at which point they will not be available, and if they are, they will be extraordinarily expensive.

The Convener: We move on to questions from Richard Lyle.

Richard Lyle (Uddingston and Bellshill) (SNP): The bill seeks to rationalise the annual report that is produced under sections 33 and 34 of the 2009 act so that it contains only information that is directly related to the outcome of the emissions reduction target for the relevant year. Is the panel content with the new approach to annual reporting? What are the advantages and disadvantages of annual sectoral reporting on the climate change plan? Are you content with what is proposed?

Caroline Rance: We are certainly content with the change to the annual reporting. I am sure that the committee will be aware that the 2009 act laid down that the statutory report on annual targets had to be produced every October. However, because the reports have been ready in June, that is when we have ended up having the statement. Having the statement in June and again in October has meant that we have been duplicating content.

The bill legislates for the target result to be available in June and for the October statement to talk more about progress on the policies, which is definitely welcome. That means that, in June, we will be able to look at the big picture of how we are doing against the targets and, in October, we will be able to look at how we are progressing against the policies that we have said we will deliver in the climate change plan—the policies on transport, agriculture and energy efficiency. The new arrangement will allow for an additional level of scrutiny in all sectors and all departments so that we can see how the efforts are faring. We definitely welcome that.

The Convener: Would anyone else like to comment?

Richard Lyle: Everyone is content—that is good. It is nice to see that everyone agrees.

The committee previously recommended that there should be no limit on Parliament in considering the climate change plan. What is the panel's view on having a 90-day limit for consideration of the climate change plan?

Jim Densham: The issue is one that some of us touched on in the technical discussions with the Government. The problem with the most recent climate change plan is that the amount of time for consideration of the plan was far too short for us and other organisations to get comments in, and for the committee to look at it and the Parliament to give its opinion. Various options for timescales were discussed, and I think that we were content with the proposed period.

Caroline Rance: There is a balance to be struck between allowing Parliament and stakeholders significant time to adequately scrutinise the plan, and ensuring that we drive the plan forward and get to the implementation stage. We need to be cognisant of the need to ensure that the process does not drift on open-endedly.

Gina Hanrahan: There is also an important point about the length of time between when the committees produced their final reports and when the Government published its final plan. That was a very long period in this context—I think that it took up to nine months from the initial parliamentary scrutiny to the publication of the final climate change plan. To be fair, very little changed; in fact, in some ways we went backwards from the initial plan in that nine-month period. We need to ensure that, during that period, there is an opportunity for constructive,

substantive discussions on how to improve the plan.

John Scott: I want to go back to carbon credits. Gina Hanrahan may feel that she has already answered this question, but I just want some clarity. In correspondence, the Scottish Government said:

> "The estimated cost of using credits to make up the gap between what is technically feasible domestically here in Scotland and a net-zero target in 2050 would be around £15 billion over the period to 2050."

I am sure that you will know how that pathway is derived. Will you pass comment on that? Did you say essentially that no carbon would be bought or sold, so it would not be a cost?

Gina Hanrahan: My understanding of how that figure has been reached is that the Scottish Government took the trajectory from 2030 to 2050 and the gap between a 90 per cent target and a net zero target, and applied the current understanding of the current or future carbon credit price to that. That is an odd sum to do, if you like, because we know that we have not exhausted all domestic effort, so why would we invest £15 billion in carbon credits when we could be investing £15 billion to create a thriving low-carbon economy, with all the co-benefits that we have outlined. I think that that analysis is not particularly robust.

John Scott: No. You have made a very good point. Do others share that view?

Teresa Anderson: One of the reasons why I think that Gina Hanrahan is referring to the lack of availability of carbon credits in other countries is that the Paris agreement requires all countries to develop their own nationally determined contributions. Under the Kyoto protocol, countries such as Gabon would have sold their mitigation savings as a carbon credit, but those will now be part of their domestic action plans. Those could be funded by climate finance directly and not necessarily as carbon offsets, which would be excellent. Carbon credits will now be used up by countries, which is why they will not be freely available. Anything else that is available will not be the low-hanging fruit; it will be very high-cost rather than cost-efficient measures.

Caroline Rance: The answer to John Scott's question is perhaps less to do with whether credits are available and more to do with what would be considered to be technically feasible. What we have not touched on is the fact that the CCC will come back in a few months' time with new advice. The CCC will update its models, significantly update its advice and bring in the IPCC findings. It is pretty inconceivable that, after all that, the CCC will come back and say that nothing will change. We are pretty sure that it will come back with much stronger targets for 2030 and 2050; indeed, earlier this month, it advertised a vacancy for a net zero emissions analyst. You can take from that what you will.

The Convener: Sadly, we have run out of time. I apologise to anybody who wanted to come in with a supplementary question. If there is anything that our witnesses feel that they did not get a chance to say, they can contact the committee. I thank everyone for the evidence this morning—it has been very useful.

10:59

Meeting suspended.

11:06

On resuming—

The Convener: I am delighted to welcome our second panel of witnesses. Joining us are Dr Diana Casey, the senior advisor on energy and climate change at the Mineral Products Association; Professor Paul Jowitt of Heriot-Watt University; Elizabeth Leighton, a director of The Existing Homes Alliance Scotland; Fabrice Leveque, a senior policy manager at Scottish Renewables; and Will Webster, an energy policy manager at Oil and Gas UK. I welcome you all.

Those of you who were in the public gallery to watch the earlier part of the meeting will know that I asked the previous witnesses whether they thought that the bill complies with the Paris agreement and the more recent IPCC report. Would anyone like to answer that question? Do you have any views on whether it does or does not?

Elizabeth Leighton (Existing Homes Alliance Scotland): Thank you for inviting me along. The Existing Homes Alliance Scotland is a coalition of housing and environmental industry fuel poverty bodies whose agenda is to improve our existing housing stock to achieve climate change and fuel poverty objectives.

The question was whether the bill meets the ambition of the Paris agreement. As you will guess, our focus is very much on energy efficiency and whether the bill provides the plans, direction and targets that will support achieving an ambitious overall climate change target for Scotland. We argue that it does not. We have argued for the bill to include measures that will progress action on the important topic of energy efficiency.

We believe that there is cross-party support in Parliament for more action on energy efficiency. We have put forward a strong energy-efficient Scotland programme, but it lacks statutory

underpinning. We have therefore argued for a statutory framework for an energy-efficient Scotland to be included in the bill. That framework would include targets, would set up an oversight budget and would make sure that the budget was aligned with meeting those energy efficiency targets.

Fabrice Leveque (Scottish Renewables): Thank you for inviting us along. Scottish Renewables is the industry association for renewable energy in Scotland. We represent about 250 members, which are primarily in the electricity and heat sectors and range from developers, installers and manufacturers to legal experts and professional services that provide renewable energy.

We understand the bill to be an interpretation of the Paris agreement, which increased climate change ambitions from aiming to meet a below-2°C target to aiming for a 1.5°C target. That sends a political signal to businesses and consumers about the future direction of travel, which is particularly crucial to an industry such as ours, which can provide solutions.

Ours is quite a highly regulated industry, and political risk must be managed, because it affects investment, the long-term supply chain decisions that we make and the long-term infrastructure that we build. For the signal to be effective and clear, we need to know what we are aiming for and when we need to achieve it by. Key to our understanding of the bill is knowing that there is a firm political commitment that can be translated into policy regarding when we need to reduce emissions by and the level we must reduce them to.

Professor Paul Jowitt (Heriot-Watt University): I am probably a bit more of a generalist than most of this panel and the previous panel. My guess is that, in broad terms, the bill's intention is to meet the Paris agreement, but I well understand why people from particular areas have particular misgivings about certain aspects of it. In a sense, then, my responses will come from a more generalist point of view.

It might be useful to tell you a bit about my background. I am an academic at Heriot-Watt University and, for 15 years, I ran the Scottish Institute of Sustainable Technology, which was originally a spin-out owned by the university and Scottish Enterprise and then a consultancy. I am a past president of the Institution of Civil Engineers, which makes John Scott one of my members, and I am on the committee for awarding the Saltire prize for marine energy, which was mentioned in connection with tidal energy being the hope of the future but something that has yet to fulfil its dream. My real interest is in systems analysis, looking at the big picture and the decision making around that, and my comments this morning will reflect that position.

The Convener: My next question is for Will Webster. I realise that a lot of asks have been made of the sector that you represent. What has been the buy-in to something that, on the surface, might lead to the demise of oil and gas as we know it?

Will Webster (Oil & Gas UK): We represent around 400 members including not just exploration and production companies but a vast range of supply-chain businesses and infrastructure owners. They are following this discussion closely and are very much engaged in enabling the whole energy transition, either by providing services to alternative energy providers or through direct investment.

What we have seen from the first phase of energy transition is that rapid progress can be achieved if the targets are aligned and in step with the technological possibilities, consumer acceptability and what is going on in politics and society. That must be a key part of the next phase of target setting. I go back to the point about just transition that was made in the previous session, because there is a more positive story to tell in that respect about the success of the oil and gas sector, how it has contributed to offshore investment and how we can take advantage of the expertise involved, the investment that has been made historically and the hundreds of thousands of workers in the sector not just in Scotland but across the UK.

The Convener: I should say that I ask this question as a constituency MSP for Aberdeenshire. How are you preparing for that transition? How much are you preparing for what I would say is the inevitability of thousands of people who currently work in oil and gas having to move to other sectors as we try to tackle climate change?

Will Webster: We are looking at the issue in a couple of timeframes, the first of which is the timeframe to 2035, which was mentioned earlier. According to the forecast by the Department for Business, Energy and Industrial Strategy, the UK will, at that point, still be using oil and gas to meet about three quarters of its energy needs.

Our projections up to that point are that production levels in the North Sea will always be below the UK's consumption level, even given the fairly ambitious targets that are being set, so we are not competing with renewables investment and other sources of supply. We have developed a vision for the next stage of investment in the North Sea, which will run to about 2035, which adds an extra generation of production. We are not trying to maintain production at the current

level of about 1.7 million barrels a day; we are trying to manage the decline in production to about 1.1 million barrels a day.

11:15

After that, there are quite a few uncertainties about where different technologies will go, as your earlier witnesses said. We see the need for a flexible approach that can take account of how technology develops, how consumer acceptability develops and how society and political discussion move. That is why we appreciate the flexibility in the bill whereby the Government will be able to take account of advice and revise targets through an iterative approach to target setting.

The Convener: Should we prepare for a shift in the use of hydrocarbons, so that they are not used for heat and the electricity supply? If we are to continue taking oil out of the ground, should we be using it differently?

Will Webster: If we look at the carbon reductions that have been achieved so far, more or less all of which have been achieved in the electricity sector, we see that a lot of those reductions have come from increased use of gas—there has been a lot of switching from coal to gas, which has reduced emissions—and from the success of offshore renewables, in particular.

If we look forward, we see a crossroads in policy, particularly on heat and industrial processes. That is where we really need the next stage of development of CCS and a clear Government policy of developing commercial and regulatory frameworks with legislation around CCS, the use of decarbonised gas and the development of the hydrogen economy. Our members are actively investing in and carrying out research and development in all those things; they are ready to enable some of the transition, particularly into the use of decarbonised gas and hydrogen. That has to be an important part of the climate change plans that are developed on the back of the bill.

Mark Ruskell: On the face of it, the signs are not good for your sector globally. New Zealand is no longer issuing permits for offshore oil and gas exploration; countries around the world are banning the sale of petrol and diesel cars by 2030; Sweden's ban on the use of fossil fuels in heating will come into force in the next two years; and the governor of the Bank of England is talking about "stranded" assets and warning markets not to invest in your sector. However, your written submission to the committee is quite bullish about the role of oil and gas in the future. What is your plan B? On the face of it, the sector looks finished.

Will Webster: We see a pretty good future for the sector over the next 10 to 15 years. The sector in the UK and globally really needs investment—

Mark Ruskell: What will happen after 15 years?

Will Webster: That takes us back to the discussion about a just transition that maintains reliable services for consumers. If we look at global forecasts—for example, those of the International Energy Agency—we find that, even in the IEA's sustainable development scenario, a gap will emerge in the supply of oil and gas globally.

Scotland and the UK have become global leaders in climate policy by setting stretching but realistic targets and hitting them without damaging the consensus on the need to make progress in climate policy. Not every country has managed to do that. It is really important that targets are set in a flexible way that allows credible policies to be developed and brings about the investment that is needed in the conventional sector as well as the alternative sector, so that the transition will be something that consumers and the economy can take—albeit that it will be difficult. That is a really important feature of the climate policy that is needed.

Mark Ruskell: Do you accept that there will be an end point for oil and gas? When is that going to be?

Will Webster: Decarbonised gas has to be part of the long-term picture, as does even oil. Even if you take out all the passenger vehicles and light-duty vehicles, that is about 30 million tonnes of oil equivalent out of a current total demand of about 150 million tonnes for oil and gas. There are a lot of other uses for oil and gas in sectors that are difficult to decarbonise—industry, heavy goods transport, marine transport and aviation. Those things will all need to be serviced over the next decades from oil and gas.

Finlay Carson: The bill only amends reduction targets and reporting duties. The consultation is therefore focused on the strategic ambition, not on delivery mechanisms. Should increased target setting be considered without considering what will be realistically required to meet the targets?

Dr Diana Casey (Mineral Products Association): Our main issue is to do with the delivery rather than the targets themselves. The industries that I represent are energy intensive and the key issue is competitiveness. The question is how the burden of meeting those targets is shared across different sectors of the economy. Our sectors, along with the power sector, have taken considerable action already. When you stretch the targets, you need to consider how you will meet them. The focus has to change from those sectors that have already done

a lot to other sectors that are harder to decarbonise.

I am not saying that our sectors should not carry on decarbonising—we have road maps showing how we can get there. However, we have to protect our competitiveness, because the materials that we supply are vital to other sectors decarbonising, to the transition to a low-carbon economy and to climate change adaptation. Our key concern is how the burden will be shared and that is to do with delivery rather than the targets themselves.

Elizabeth Leighton: We have argued that the inclusion of energy efficiency measures and targets relating to energy efficiency would be in scope because that is part of plans to support the transition. That would build on the 2009 act, which included a significant section on energy efficiency policy. The new bill is framed around setting emissions reduction targets, so we believe that including energy efficiency measures is compatible with the principles of the bill.

That aside, in terms of the mechanics, you have already heard that targets are essential in order to drive innovation and provide certainty for business. Evidence has been provided during this stage 1 scrutiny that we risk losing all the economic benefits—the jobs benefits and the benefits to the wider economy—if we do not provide certainty so that businesses and home owners invest. Having that clear pathway set in statute will give them more confidence to go ahead and invest. We can then win those jobs benefits rather than seeing them gradually leaking to other parts of the UK or even Europe because our supply chain has not developed.

It is critical that we have the targets and that we have the statutory underpinning. The UKCCC progress report highlights the energy efficient Scotland programme as an exemplar for other sectors and it specifically mentions that there is a "statutory underpinning" to the commitments. I would argue that there is not a statutory underpinning unless something is included in the bill.

I should add that we are aware that the Government has indicated that there is potential for consideration of an energy efficient Scotland bill at some point in the future. However, failing any firm commitment to that bill or details on what it might contain, I fear that we would be failing the chance to meet the climate change targets if energy efficiency targets were not included in the bill. We need to take advantage of the opportunity at hand and avoid further delays. The timing fits quite well with the implementation of the energy efficient Scotland programme, which will go into the implementation phase from 2020.

Fabrice Leveque: When it comes to near-term delivery, if the question is whether there are areas of current climate policy in Scotland that could be improved, the answer is yes—there are areas of planning policy and heat policy that could be improved. A bill is always an opportunity to do that.

On whether the target works as a long-term signal, as I said, it is about setting the problem and allowing us to work out the solution. At the moment, the way the target is phrased is kind of saying, "We will endeavour to get to net zero—that is roughly the ambition." Our industry can point to those words, but that is very different from a firm target with a number and a date. In terms of policy risk, for a business that is looking at the bill, if there is a line in it that says what we are roughly aiming towards, that is very different from having clear targets with dates and numbers attached. A firmer target gives feedback into greater clarity and certainty.

We have touched a little on the point about technical feasibility and whether we should set a target now given the uncertainty around driving the last few emissions out of the system. I have a point on long-term targets and near-term ones. Near-term targets such as the 2020 renewables targets have to be achievable, because we have to think that we can get to them and they have to instil confidence. Long-term targets such as the 2050 target, which is more than 30 years away, are more about saying, "Here is where we would like to be." It is about setting a challenge and allowing us to work out solutions. To clarify, with the near term, we absolutely have to be grounded in what is feasible. In the longer term, given the scale of what we are talking about, we have to consider the time that there is to work out the solutions.

Will Webster: Credible ambitious targets are good in that they provide credibility to investors and allow them to modify their strategies and think about what sort of businesses they want to be in future. The same goes for households to an extent. Ambitious targets that are based on evidence of what is achievable and what can be delivered in terms of consumer acceptability have a positive essence in that they give policy makers cover for giving strong positive incentives to investors to deliver the investment that is needed. To an extent, that has been the experience of the first phase of decarbonisation. The initial set of targets allowed positive policies to be developed that brought about a significant amount of investment in technologies from the private sector. There is a lesson to be learned from that for the next phase.

Professor Jowitt: Setting long-term targets does not mean that you can leave them and not

do anything about them—you have to start to deal with them now. So far, some of the big hits in carbon reduction in Scotland and the UK and in the developed world generally have been made by exporting our carbon emissions to developing countries and reimporting goods. That has been a quick win for us in some ways. However, the longer-term targets will involve a degree of behaviour change, which is much more difficult to do and needs to be started now.

In the decision-making world of politics, in setting long-term targets, you quickly get involved in discounted cash flow and discounting. Of course, the reality of discounting is that, by definition, it discounts the future—that is what it says on the tin. To deal with that, we need to start making investments now to get the long-term benefits that we need.

To be honest, large-scale complex problems are not easily dealt with by cost benefit analysis. During a talk that I once gave in Australia on climate change and international development, I asked the audience—admittedly, it was mainly engineers—given that the two most important decisions that we make in life are on our house and our partner, who among them had ever made either of those decisions using that method. One person put their hand up. I have to say that it was a man, although I did not ask whether the decision was on the wife or the house.

Clearly, large-scale problems need a more mature decision-making mechanism than some of the instruments commonly used in government and by treasuries. The world is at a critical point and we need to start making long-term decisions and take actions now, or it will be too late.

11:30

Finlay Carson: In your first answer, you suggested that you had misgivings and talked about “credible targets”. Is there a risk that, if we do not have credible targets, we will not get the investors that we so desperately need following the process?

Professor Jowitt: Yes. We need to start making real decisions that will have a real impact, not wiffle-waffle ones.

Will Webster: To underline the point, credible targets allow policy makers to develop credible policies. The targets feed through into the climate change plans and policies. Making climate policies is not an easy task. There needs to be an appropriate framework for Governments to do it, and that comes from having targets that are in tune with what is going on and what we think will be going on in the next 20 years.

Mark Ruskell: We heard some useful and interesting evidence at the beginning of our scrutiny of the bill from Swedish witnesses. They discussed how the Swedish Government working with industry put in place sector action plans, particularly for the steel and cement sectors. Where do you see the UK in terms of that sectoral approach? Have we put enough focus on transformative technologies and linking those to where the sectors see themselves in global markets and how they position their products and services?

Professor Jowitt: Probably not, but we need to be careful that we do not lull everyone into the idea that technology will fix it. We need to change what we do as individuals, rather than just hope that technology is going to come in with a magic bullet and solve the issue for us. I will come back to that point later, if the committee would like.

Dr Casey: We have an action plan for the UK cement sector that the sector produced with the UK Government, on the back of the road map that was published in 2015. The action plan is not exactly what we thought it was going to be. The road map showed what reductions could be made, the barriers and the main technologies, and we hoped that the action plan would put in place what we need to get there. It does not go quite that far, but it is the start of a conversation with the Government. We have valued that.

We know the three technologies that will decarbonise the cement sector. One is CCUS—carbon capture, utilisation and storage—which is the breakthrough technology. The sector itself has done a lot of research. A lot of the projects are in Europe rather than the UK, but the MPA and the majority of our members are involved. A couple are at the point where funding is required for demonstration projects. We are not expecting everyone to do the work for us, but we need support. I think that about €90 million is needed for the two demonstration projects. At the moment, those are on hold until we have the EU emissions trading system phase 4 innovation fund. Industry has committed a considerable amount, but there is still work to be done.

Mark Ruskell: Are you concerned about the possible hiatus with the ETS after Brexit and about whether we will see the same level of funds going into the innovation fund if we end up with a carbon tax for a year, or a return to an ETS but under a different guise?

Dr Casey: Yes, definitely. I do not want to say that we are pinning our hopes on the innovation fund, but it should be a good source of support for those kinds of projects. Brexit introduces a huge amount of uncertainty.

We are worried about the carbon tax for other reasons. As a sector, we would like emissions reduction at lowest cost. The carbon tax that the chancellor announced at £16 per tonne of CO_2 would render us uncompetitive. In a no-deal Brexit, the chances are that the carbon price would crash. We would then be paying far higher than our competitors in Europe. That leads on to the carbon leakage that Professor Jowitt mentioned, which is a real concern.

Mark Ruskell: So we are not at the limit of technical feasibility with your sector.

Dr Casey: The technology definitely exists, but there is work to be done to get it to commercial deployment.

Professor Jowitt: The advances in cement production have been quite remarkable, but in construction we have to distinguish between capital expenditure carbon and operating expenditure carbon. Opex carbon—that is, the energy efficiency in use—will dominate the carbon budget of any construction project. A bridge can be built with very little carbon, but the traffic usage over it will be the killer and the method of cement production does not have an impact on that.

A carbon tax and carbon trading were referred to. I would be very worried if anybody pinned the future of the planet on the market and hoped that it would come to save them. It will not. If the carbon price dropped by 20 per cent on Monday, would that mean that the value of the planet had somehow fallen by 20 per cent? Of course it would not. We need to be very careful about the extent to which we rely on the market to fix the CO_2 problem.

Rhoda Grant: I think that we all agree that we need transformational change to meet the targets, but sometimes such change leaves people behind. How can we have transformational change in a fair and just manner? We have heard before about the move to electric vehicles, which is fine if people can afford them, and about people ensuring that their houses are insulated and have all the latest renewables. People who can afford that do that and end up saving money, so it is a win-win for them, but people who do not have the money cannot do it, so they miss out twice. They are penalised by taxation to discourage the use of energy, for example.

Elizabeth Leighton: I am pleased that you have asked that question, because a just transition has to be fair for users of energy as well. Ensuring that a low-carbon transition does not lead to unaffordable energy when we are trying to tackle fuel poverty is a real issue. There is a big commitment coming from the Government in that way. With energy efficiency, we have a chance to redress the balance between rural and urban and to invest in properties that have been neglected in many of the programmes that there have been to date. We have the chance to say that there will be greater investment so that those properties will be among the first places to benefit from the transition to low carbon through investment in moving from very expensive oil heat to some kind of renewable heat and very energy-efficient properties.

That is an example of where people will benefit from the low-regrets options that are now available, which should be taken forward as part of the fuel poverty programme for those who cannot afford them. They should be part of the warmer homes Scotland scheme and the investment to meet the fuel poverty targets that are set out in the energy efficient Scotland programme. That emphasises the benefits of energy efficiency, which is quite mature in Scotland. There has been a lot of investment in energy efficiency to date, and we should build on that track record and put the targets into statute through the bill.

Rhoda Grant: Is there enough for the people in the middle? I am thinking about draughty old croft houses in my constituency. We all hear about the croft houses in picturesque places that are going for huge amounts of money, but many croft houses have very little value. They do not have a value that would allow people to invest and borrow against them to really make a change to their insulation. Is enough available for those people who are earning but might not be on high incomes and who might need to clad their houses totally to make them efficient? Is enough available on the spectrum of assistance to help them?

Elizabeth Leighton: That is one reason why we have argued that the budget needs to be aligned with meeting the targets that are set out in the energy efficient Scotland programme. The work has not been done to see whether there is enough in the programme, estimating what would come from the public sector and what would be levered in from the private sector and householders. Is that a realistic balance? What financial incentives, loan schemes and so on are being used to achieve that balance? Perhaps that modelling has been done—I have not seen it published—to give us and the home owner market confidence that it will be able to achieve the vision that it should be able to achieve as part of the just transition to low-carbon, warm and affordable-to-heat homes all over Scotland.

Will Webster: Just transition is an important concept and an important part of successful transition. It means making the most of the expertise that we have in the traditional energy sectors, including the several hundred thousand jobs that there are in oil and gas. That expertise is a resource that we need to make the most of in the energy transition. All our offshore expertise

can and is being used in the alternative sectors, and it has to be an important part of the energy transition that is put in place in Scotland and the UK.

A just transition is also one that avoids a dislocation of the energy system. That is important for consumers. We are now approaching the winter and you will remember that, last year, we had to import a lot of liquefied natural gas, particularly during the latter stages of the winter. That comes at huge cost because you are paying Japanese LNG prices of £1 a therm or £1.50 a therm whereas the usual price is around 50p a therm. You pay three times the price if you end up with a dislocation of your supplies as a result of an energy transition that is not considered and in line with what is credible and good for consumers.

Richard Lyle: I have two comments. First, we are not storing enough gas. There are two gasometers on the M8 just outside Glasgow that have not been used for years.

On loft insulation, the boiler scrappage scheme and all the other different programmes, I was a councillor for 30 years and I have seen more of those programmes in the past 10 years in my local area of North Lanarkshire. There is a tremendous number of heat-saving schemes. I am sure that you know about Myton houses, which were built in the 50s and have cement on the outside. In an area of Motherwell, which is not in my constituency, a section of Myton houses is being encapsulated in foam and then roughcast.

There is a tremendous number of programmes but, in my experience, housing associations are sometimes not tapping into them. Thank you.

The Convener: Do you have a question?

Richard Lyle: No, I just wanted to make those comments.

Fabrice Leveque: On the point about just transition, the offshore wind sector is working with the oil and gas sector to look at the ambitions of both sectors for 2030 and beyond. For the offshore wind sector, that is about securing skills and making sure that we have the jobs and expertise to deliver the increasing ambitions of the sector now that costs have reduced significantly. It is also about working with the oil and gas sector to make sure that there are opportunities. One issue that that sector is trying to deal with is the fact that it has an aging workforce. The two sectors can work well together and we are starting to do that. Things are starting to come together already.

Angus MacDonald: I have some questions on the Scottish Government consultation on the bill, which took place during the summer before last. You heard me ask the previous panel about the consultation. I am keen to hear your views on whether the results of the consultation are adequately reflected in the bill. Should there have been proper consultation on a net zero target and so on, including the delivery of the target and the establishment of a just transition commission, which we have just discussed?

11:45

The Convener: Would anyone like to go first? Are there no comments?

Angus MacDonald: Perhaps there are comments on the just transition commission, as I imagine that the witnesses would say that that should have been consulted on.

Will Webster: It could help to have a reporting body that can make a judgment on certain matters. Our view is that the processes that are set out in the bill are quite useful because they will allow an iterative discussion to take place on setting a net zero target and revising the targets, with advice from suitable parties.

Elizabeth Leighton: Given our organisation's focus, in our response we did not comment specifically on the overall target. However, we have started to have dialogue with the just transition commission about fuel poverty and affordable energy. The commission is therefore aware that those issues are on its agenda.

John Scott: I have a supplementary question on the Scottish Government's consultation. Are the results of the consultation adequately or properly reflected in the bill? Would you rather see the bill take a different shape?

Elizabeth Leighton: As I said, we thought that there should be more about plans—and, I would add, policy programmes—that support the achievement of the targets. We have argued specifically for measures on energy efficiency targets to underpin the energy efficient Scotland programme. We put that in our consultation response, and I am aware that others did so too. I do not think that the bill reflects those consultation responses.

Fabrice Leveque: I cannot give an answer on the detailed specifics but, as I said earlier, our view is that an opportunity to set a specific date was missed. That is our key takeaway from the bill.

Dr Casey: It is commendable that Scotland is setting ambitious targets, but our concerns are about going above and beyond what the rest of the UK and the rest of the world are doing. That takes me back to my earlier point about competitiveness. In some ways, we were hoping that we would stay aligned with the UK, but it is commendable that Scotland is setting those stretching targets.

The Convener: Talking of targets, we move to questions from Claudia Beamish.

Claudia Beamish: I have a quick supplementary question for Will Webster and Fabrice Leveque on the decarbonisation of heat. Will Webster highlighted the need for fossil fuel to be imported for that, if I understood him rightly. I would like both your takes on whether there is a choice and whether there could be a transition to other forms of heat. I fully respect the importance of fuel poverty as an issue, of course.

Will Webster: A lot is going on in that area. The gas distribution companies, including Scottish Gas Networks, Cadent and Northern Gas Networks, are running several projects to look at the feasibility of reforming natural gas—methane—into hydrogen and capturing the CO_2 by applying known technologies that can, to a degree, be bought off the shelf. For example, there was an initial study on converting the whole of Leeds to hydrogen heating. A report by Northern Gas Networks into whether that could be extended to the whole north of England is coming out on Friday.

The committee might well know of similar initiatives, such as the Pale Blue Dot Energy project in the Aberdeen area, and the Cadent project, which is about converting six or seven industrial users to hydrogen in the Liverpool and Manchester areas. All those projects are at the feasibility stage, and they will be part of the gas distribution networks' thinking on the future supply of gas. There is also a CO_2 capture and storage element to such projects.

To a certain extent, all those technologies exist—there are things that are being, and can be, done. The work is around how we put the technologies together to make hydrogen a part of domestic heating and industrial use.

The Convener: What is stopping us doing that?

Will Webster: That is a good question. It is not just a question of finance. However, financial support is important for the demonstration stages of such technologies and for developing a commercial framework that can reproduce, to an extent, the success that we have had with offshore wind, for example.

The other aspect that needs to be thought about is the legislative framework. If we want to roll out something at scale and to have people invest in it, they need to have an idea of the parameters in which we will be operating. Energy suppliers across the board are pretty highly regulated, so if a supplier is looking at a new product—a new source of energy—they will already be thinking about how they will be regulated in that world. That issue is not particularly present in the discussion.

We need to think about the commercial framework and the regulatory framework. We hope that Governments will address those matters in response to the initiatives that I have mentioned.

Fabrice Leveque: The Scottish Government's energy strategy sets out two extremely different scenarios for the energy system. One scenario primarily involves electrification and using electricity, with either ground-source or air-source heat pumps being used in buildings. The other scenario involves hydrogen, which, primarily, would be produced from natural gas, with the carbon sequestered. Those are the two options. Under the electrification scenario, there would be much less fossil-fuel use, although I do not think that it would be entirely ruled out. The primary energy supply would come from electricity.

Clearly, those are two extreme examples. On which scenario is better, our view is that the answer probably lies somewhere in the middle. We have some concerns regarding hydrogen. As we have heard, there is an awful lot of additional work to be done in putting the various bits together, demonstrating the full chain and rolling it out—it is quite a big infrastructure project. Our concern is that we do not want that work to distract from building on the technologies that we have today.

For example, there is arguably still quite a lot that could be done with heat pumps to help to grow the market as we have grown the wind turbines market. We have provided confidence by saying that we will do it at volume, which has allowed supply chains to grow and get cheaper.

We have not done that with electric heat; we are only beginning that work. Things are getting much better, because the grid has decarbonised. Five years ago, a heat pump produced roughly the same emissions as those from a gas boiler. Today, thanks to the rapid decarbonisation of the electricity grid, a heat pump produces something like 25 to 30 per cent of the emissions from a gas boiler. Therefore, such pumps have become a true source of low-carbon heat. We still need to do more to help the sector by rolling out the technology and working out some of the issues.

The same goes for district heat networks, which is another technology that we could roll out in the near term. The networks are large pipes in the ground through which we pipe to buildings the heat that is generated in power stations. They could take large-scale heat pumps, perhaps by drawing on energy from rivers or the air. Again, that is a technology that is tried and trusted, and we do not want the focus on longer-term infrastructure, such as that for hydrogen, to detract from the nearer-term technologies that we can use.

Dr Casey: Decarbonisation of heat is also relevant to industry. Biomass has not been mentioned yet, and the cement sector has done quite a lot of fuel switching to biomass. The Government provides incentives for the biomass to go elsewhere—to smaller domestic users through the renewable heat incentive or to larger power generators through the renewables obligation, for example—but one of the things that is stopping us converting is that we unfortunately fall right down the middle and do not get any incentives. The concern is that, instead of increasing the use of biomass and reducing emissions overall, we are just diverting it.

I have another point to make about hydrogen and the barriers to its use. As other members of the panel have said, more work is needed. Whatever fuel is used in the cement sector can have an impact on the quality of the product—that is one potential barrier. There are also safety risks with the use of hydrogen that require careful assessment.

Claudia Beamish: Diana Casey has highlighted competitiveness and the challenges that that brings, which we are all aware of. There is also the question of innovation and the fact that we do not know what will happen in the 2030s and 2040s.

The bill proposes a 90 per cent target, but should it set a net zero target for all greenhouse gas emissions? What are the options? I am looking for some short comments on that.

Will Webster: The bill sets a target of a 90 per cent reduction. Building on what Fabrice Leveque said, we need to think about and develop all the technologies if we are to succeed in achieving that objective. It will be a case of horses for courses. We need to remember that we start from a position in which 80 per cent of homes in the UK—the proportion in Scotland is probably similar—have a gas boiler. To an extent, we must work with what we have got. We will need to have CCS to achieve an 80 or 90 per cent target. All the international papers on the subject show that CCS is a necessary part of the mix if we are to achieve that level of greenhouse gas reductions.

As far as a net zero target is concerned, we understand the process that is set out in the bill, which we think is quite a sensible one, in that it involves a set of criteria, a process for getting advice from an independent party and a democratic decision-making process. Having such a framework seems to be a sensible approach, rather than including in the bill a date by which net zero emissions will be achieved.

Elizabeth Leighton: As I said, we have not commented on the overall target, but we are firmly supportive of the target in the energy efficient Scotland programme of having near zero carbon building stock by 2050. In fact, we have said that that should be brought forward for the domestic stock, because we are further ahead on that than we are on the non-domestic stock. It would therefore be reasonable to expect action to be taken more quickly on the domestic stock.

We should remind ourselves that the IPCC special report emphasises the need for urgent action over the next decade. We need to innovate and to look at longer-term solutions. At the same time, we cannot delay in doing what we can do now with the tried-and-tested technologies and the very-near-term technologies. We know that cost-effective energy efficiency measures can reduce our energy demand—this is a UK figure—by 25 per cent. Over the next 20 years, that is equivalent to the annual output of six nuclear power stations.

There is a lot that can be done now, which is why there is a need to drive action through statutory targets and to put more emphasis on things such as making the jump from F-rated property to net zero carbon property. Through schemes such as the Dutch Energiesprong scheme, that can be done on a street-by-street basis, with little disruption, using off-site construction, and it can be paid for using the fuel savings. The solutions are at hand; we simply need to up the scale. The area-based schemes have been a big success, but they are not going fast enough or are not taking multiple measures—some schemes deal only with insulation, for example. The fuel poverty programme is a really good programme, but it is tackling only 4,000 homes a year. That must be multiplied many times.

12:00

The Convener: Stewart Stevenson wants to ask a quick question.

Stewart Stevenson: My question is specifically for Elizabeth Leighton. Should we revisit the EPC definitions? Under the current definitions, my house cannot get to zero, because we have two-foot-thick walls with no place to put cavity wall insulation. You get 10 points for having such insulation, but the fact is that we are better insulated than we would be with it. However, even though we are doing better in practice, the EPC definitions prevent us from getting an A rating.

There are similar difficulties with the other ways in which the system works. For example, it does not actually measure a house's outputs and inputs; instead, it uses surrogates to make estimates that are in some cases imperfect.

Elizabeth Leighton: The EPC, which uses an A to G scale, is a useful metric because it is simple. People understand it and it is used for appliances, cars and so on. However, I agree that its

underpinning methodology needs to be updated, and that it should keep up with new technologies and new knowledge of traditional buildings. A working group that is hosted by the Government is looking at the matter; I hope that it will address such issues. Obviously, not every house can get an A rating, but we should be striving to get as close to that as we can.

Fabrice Leveque: I come back to Claudia Beamish's question about the 90 per cent and net zero targets. To Scottish Renewables the science is very clear: the ambition is to get to net zero emissions by mid-century. I point out that, 30 years ago, the European wind industry was building its first turbines to demonstrate the concept of wind energy; 30 years later, we are providing something like 25 per cent of the UK's electricity, and we could be providing 50 to 60 per cent by 2030. We have come on in leaps and bounds in 30 years.

However, there are sectors that will be affected by the target that have not yet really felt the pull of the policy change on what they need to do. The message is that in those sectors another five or 10 years might elapse before they start to work towards the target.

The Convener: Should the bill clearly define pathways for sectors?

Fabrice Leveque: The bill needs to contain some near-term measures, because some actions need to be strengthened with regard to what we are doing today. I do not think that the bill needs to set out a technological pathway all the way to 2050; that timescale is very long term, and the point of the target should be to allow technical challenges to be recognised and to let industry innovate and work out what it needs to do in order to deliver the target.

The Convener: Is the message getting across strongly enough about the economic benefits and business incentives that are out there, and about the fact that there will be some real wins for industry if investment is made in innovation?

Fabrice Leveque: Clearly that message has come across strongly enough in the renewables electricity sector, given the benefits that we are reaping from years of investment. However, action takes a long time to happen in the transport and heat sectors, in which the conversation is just starting. The fact is that support for the technologies, particularly in the heat sector, has ebbed and flowed over the years, so it has been difficult to make the case that could be made for offshore wind and to say, "Give us 10GW of volume and we'll deliver a turbine facility and investment in ports across the east coast." The heat sector has not been able to do that, because of uncertainty about political ambition in that regard.

You are therefore right to suggest that the potential benefits have not been advertised enough, but there are large benefits to be had. We just need to have the confidence to go after them.

The Convener: So, has a lack of consistency in Government policy made everyone nervous?

Fabrice Leveque: Yes.

Will Webster: That is what we are looking for in the Government response to the CCS cost-reduction task force report, which emphasised the regional nature of the industrial clusters in which CCS can be made to work, and the knock-on industrial policy benefit from developing those poles of activity in co-ordination with what already exists for the oil and gas and renewables sectors. We have a chance to build on that for a new energy sector, so we are looking for the Scottish Government and UK Government to respond positively to the report.

The Convener: Other countries are doing things, but—of course—there are two Governments in charge of policy.

Will Webster: Indeed.

The Convener: Are you saying that it is not enough for just the Scottish Government to set targets and to take a consistent approach, but that the message needs to go to the UK Government, too?

Will Webster: That is right.

John Scott: You spoke about hydrogen earlier, but not in relation to the transport sector. I appreciate that it is not necessarily a sector that you would be expert in, but is the future for transport electric or is it hydrogen?

Will Webster: The jury is still out; it depends on the nature of the transport. For personal and commercial vehicles, especially ones that return to base a lot—even public transport—electricity seems to be fairly promising. We start with the assumption that the electricity future for transport is already real and can only get bigger. Hydrogen is being used for trains and buses in Aberdeen, for example, and there is the potential to use it for personal passenger vehicles.

We start from the idea that we will not necessarily get to a point at which one will dominate the other: what will happen will depend on the circumstances and what consumers choose. Consumers do not always choose the best technology—they choose what they find to be most convenient or what looks nicest. That is not quite the right way of putting it, but there is a sense that we cannot, as though we were an all-

powerful entity, say that everyone will chose this or that.

There are several technologies around. People can go on several types of journey—that applies to transporting goods, as well. It depends on the circumstances. Hydrogen has most potential for large-scale, long-distance transport, including heavy goods vehicles and shipping, which currently use a lot of gas and will continue to do so for a number of years.

Richard Lyle: Would we be able to produce enough hydrogen? I saw last week that Shell was all over Twitter, promoting hydrogen for cars. In the last 50, 60 or 100 years we have changed and used many different types of energy. Is not that the case?

Will Webster: That is absolutely true. When cities were still using town gas, it was made from 50 or 60 per cent hydrogen. Use of hydrogen is therefore possible: the technology is out there. Governments should look closely at it and think about what needs to be done in respect of the commercial and regulatory framework.

Mark Ruskell: I will ask about the interim targets, in particular the 2030 target. The IPCC has refocused us on the importance of taking action in the next decade. Do you think that the 2030 target is sufficiently challenging?

Fabrice Leveque: Can you clarify whether you mean the target that we have today or the one that is proposed by the bill?

Mark Ruskell: I mean the target that is proposed in the bill.

Fabrice Leveque: I cannot comment on whether the target is sufficiently challenging in terms of the climate science, but I think that it is achievable. For the 2030 target it is a question of costs, rather than technical feasibility: we could hit other targets, but the questions are: at what cost, and how would the costs be distributed? In the energy system—electricity and heat—we have the technologies to do it, but we need political backing and a programme that will bring costs down properly.

Mark Ruskell: I will come back to heat. I had heard that we are still installing oil-fired boilers as part of fuel poverty schemes in Scotland, which seems to be odd. Are our policies sufficiently joined up? That seems to be extremely low-hanging fruit in terms of making progress. Are there other areas, particularly around heat, in which we could be accelerating progress in the near term? You talked about the long-term picture and whether we will electrify heat or use alternatives to natural gas, but what actions could we take in the next few years that might get us back on track for a higher 2030 target?

Fabrice Leveque: In respect of the near term, the point that Mark Ruskell made about oil-fired boilers is important. The fact that that is happening demonstrates that there is not quite a proper read-across from the climate targets through all the different parts of Scottish Government policy. Arguably, if we are paying to replace heating systems, we should be fitting something that is future proof—a heat pump or a biomass boiler, for example.

The problem that Mark Ruskell highlights is also the case in the new-build sector. The Scottish Government has powers to set standards for new buildings, but the majority of new buildings currently have fossil-fuel heating systems, some of which are oil systems. The review is currently on-going, which gives us an ideal opportunity to ensure that we are installing low-carbon heating systems in new buildings.

New build is the cheapest place to do that, and it allows the supply chain to do more, which is what we really need to ensure is happening if we want to keep costs down. We have a fragmented and relatively small heat supply chain. With a larger market—which would be created by ensuring that all new buildings have low-carbon heating systems—the supply chain companies could reduce their overheads, improve co-installers' confidence and knowledge, and expand the distribution and supply chains so that they can serve all of Scotland with the relevant skills. Right now, some areas have to pay a premium because installers have to travel from quite far away.

The Convener: Do we have a skills shortage in relation to installation of future-proofed systems?

Fabrice Leveque: That is not the case at all. With regard to people who supply low-carbon heat systems in domestic buildings, the supply chain has shrunk over the past three or four years in Scotland as the market has dipped. That has happened partly because incentives have been cut, which has created a public perception that it is not really worth doing any more. Further, the oil price in rural areas has dropped, and the high oil price was one of the things that drove a lot of people in rural areas to consider alternative heating systems. There is probably quite a bit of slack in the supply chain.

Of course, if we were really ambitious and go more quickly, we would have to make sure that we had the right skills and training in place. We can do that in Scotland. It is not beyond us to ensure that we have a planned approach and that people have the skills that they need.

Elizabeth Leighton: I agree that there needs to be a bit more joining up, because we are still connecting people to the gas grid—we are extending the gas grid. Most people would

assume that there will just be a switch over to hydrogen at some point, so they do not have to worry about anything. However, if that is a solution—there are many questions about whether it is—it is a distant prospect, so we must do all that we can now with regard to low-hanging and middle-hanging fruit in energy-efficiency schemes and low-carbon heat. We have to join the two approaches together. Area-based schemes can no longer be just about solid-wall insulation; they also have to involve ways of addressing the heat issue.

Will Webster: I think that we should be a bit careful about talking about things that are either long-term or distant. As Fabrice Leveque said, over the past 30 years, the wind sector has gone from a low base to where we are now, with 12MW turbines being built. Ever such a lot can be done in a 20 or 30-year period. Hydrogen technology exists and is out there; it is not so experimental. To an extent, progress in that area is about overcoming the chicken-and-egg issues that exist with any big change from one system to another system.

The issue about fuel poverty schemes comes down to the circumstances of the individual case. Not all homes are suitable for heat pumps, for example, and some are not connected to the system. It is not an area in which we have a lot of expertise. The specificity of individual cases must be taken into account.

12:15

Dr Casey: We have talked a lot about decarbonising heat itself. Our concern is about Scottish Government policies on the fabric of buildings. We have evidence that heavyweight building materials can save a lot of carbon. On the reporting side, we feel that a lot of carbon savings can be made from looking at cement and concrete over their whole life. Concrete absorbs CO_2 and stores it during its life, but that is not measured or reported on. If we are looking for a net zero emissions target, we need to be sure that we include all possible carbon sinks. We are coming up with a methodology to measure that so that it can be included in reporting.

Heavyweight materials also provide thermal mass, which keeps the temperature of buildings stable, so their occupants are less likely to turn up the thermostat. Whatever people's heating choices—oil, electric or whatever—they use less of it, which goes back to the energy efficiency points that have been made.

We are concerned about the near-term targets. If we strongly promote use of timber in construction, we will lose out on the benefits that I have just described. In the long term, the operational carbon of a building could end up being worse.

John Scott: You have brought us nicely to my question. What scenarios might require changes to the interim targets that have just been described? Might other scenarios require changes to the interim targets before 2030, for example? What are the practical implications of getting to those interim targets?

The witnesses do not seem to have any answers to those questions, which is absolutely fine.

Should the ability to modify the targets in both directions be included in the bill? We are asking all the panels that question.

Professor Jowitt: Common sense would say yes.

John Scott: That is all the answer that we are looking for.

Will Webster: If the bill sets out a good governance process for that, it will be quite valuable in policy making.

Finlay Carson: Section 5 sets out the target-setting criteria, including scientific knowledge, technology, energy policy and so on. Are the target-setting criteria fit for purpose and appropriate? Should they align more closely with the climate change plan's sectoral approach?

Dr Casey: Our response sets out five criteria that need to be included. They cover whether we have the cost-effective technology to meet the targets; economic circumstances and the competitiveness thing that I have been going on about; policy; fuel availability and whether there is enough biomass to go around the decarbonised sectors that need biomass; and interaction with industrial strategy and clean growth. Those are the five criteria that we would like to be included in the bill.

Elizabeth Leighton: I think that our consultation response said that the criteria should make sure that we take into account the social benefits. We have talked a lot about economic benefits and impacts, but widespread social, health and wellbeing benefits are associated with the transition to low carbon. They are well documented in the case of energy efficiency and housing. That criterion should be taken into account in target setting.

Will Webster: I generally think that the targets make a lot of sense and go back to some of the points that we made earlier about a just transition and so on. I will not repeat those points.

It is good to have a holistic set of criteria that policy makers can use to make a sensible

judgment about all the various aspects and implications of adopting a target.

Fabrice Leveque: I am not familiar with the target-setting criteria, but I guess that there is a fairly strict definition of technical credibility and the ability to show a pathway. I go back to my previous point that, for our members and our industry, the long-term target, which is 30-plus years away, is a political signal that tells us where we need to be. We do not expect the Government to draw a line and tell us exactly what the solutions will be—that is mostly for our industries to do. It is possible that the technical criteria and eligibility have been set very strictly and that that is why we have come to the current proposal, which is a process to set a date in the future but not now.

John Scott: Let me develop that theme. I know that the aviation sector is driven by the criteria and regulations that are set for it. It seems to have the ability to develop more and more clever and fuel-efficient engines. Are you saying the same of your sectors? Mr Webster rather hinted that the hydrogen sector needs regulations and criteria to be put in place to allow people to develop the innovation that is definitely out there. Is that correct?

Will Webster: Yes. That is not necessarily part of the technical criteria for choosing an emissions target, but we need a suitably ambitious target that is achievable and that is backed up with the appropriate legislation to allow innovative technologies to come in. That can be about the commercial investment framework or the legislative framework for issues such as dealing with customers. All those things need to be in place to give investors reasonable certainty about the nature of the investment, particularly if it is something relatively new.

John Scott: Would it be helpful if that was in the bill?

Will Webster: It does not necessarily have to be an integral part of the bill. The process that is set out in the bill, of going from the targets to the climate change plan and into the policies, is a sensible way of proceeding. In fact, it makes more sense to have those things sequential than to put everything in one great big bill that tries to cover everything at the same time.

Stewart Stevenson: The bill talks about advice from the Committee on Climate Change, particularly in relation to the net zero target being "achievable". What does "achievable" mean to each of you, or to those who wish to comment?

Dr Casey: I would say that "achievable" is about decarbonisation without deindustrialisation.

Stewart Stevenson: Just to check, are you saying that it is not linked to some magic insight about technology that will be available but is simply about a guiding set of principles that will get us to the destination?

Dr Casey: Obviously, the technology has to be part of it. My comment is about the need to keep our foundation industries in Scotland. We know what technologies we need to get us there, so let us support our industries to get commercial deployment of those technologies, so that we get decarbonisation without having to import materials that we currently produce in this country.

Fabrice Leveque: "Achievable" means that, theoretically, there is a way to reduce emissions to the level that we have set. My understanding is that the ways in which we do that for the very last few bits of emissions are still relatively speculative and will require a fair amount of innovation. However, that is within the bounds of possibility and is, therefore, achievable.

The issue of costs is a different question. That will be mediated by public and political appetite for reducing emissions. There is no worry that the costs will not be mulled over and factored into our decision making; rather, the danger is that they will weigh down on what we do. In terms of an ambition for emissions, "achievable" should mean what is plausibly doable and what we know we have to do; we can let politicians and the public fight over the speed at which we do it.

If we look back at the history of climate policy, we see that the reason for uncertainty and, for example, the reason why we have not developed manufacturing of wind turbines in the UK is the back and forth of policy. We need clarity over decades to make such investments. There is no danger of business, commercial or competitiveness worries coming into this debate. For the purpose of the bill and the long-term target, the debate must be about what the science is telling us to do and where we are aiming to get to.

Professor Jowitt: Given that the scientific evidence of climate change is overwhelming to most people with a rational mind, the need to set a target should be blindingly obvious. If we do not do it, it will be too late. The question, then, is: how do we get there? Some people will not like it or the impact that it might have on our "quality of life"—I put that phrase in inverted commas—or, in the phrase used in the bill, "sustainable economic growth". Given that perpetual growth defies the second law of thermodynamics, we are going to have to re-look at that. I think that it might be "sustainable economic development" that is needed rather than "economic growth".

As we move towards the target that we have to set, the question is whether you approach it as a technological optimist or a technological sceptic. I

have highlighted the risk of assuming that technology will sort things out. The fact is that, if you start as a technological optimist, there is no guarantee that such an approach will work. However, if you start as a technological sceptic, there is no guarantee that that will work, either. You therefore have to think about what the outcomes will be if you adopt the technological optimism path. If it turns out that the game's a bogey, you are rather up the creek; if you take a slightly more cautious approach, saying, "Technology won't necessarily fix this—it's going to need a change in behaviour," and it turns out that technology can help you, you will be better off.

There is a wonderful paper, written by a chap in the United States called Costanza—I will happily give the reference to the committee after the meeting—in which he explores this issue and sets out four scenarios. On the one hand, with the technological optimist approach, you get what he calls the "Star Trek" outcome if it works and the "Mad Max" outcome if it does not. On the other hand, with the technological sceptic approach, you end up with either big government or ecotopia. He gets people to consider the decisions that they might make and the regrets that they might have. It really is quite staggering. Committee members might like to look at that paper. I am happy to provide a copy if that would be useful.

The Convener: We will take a copy of it.

Stewart Stevenson: I have always had doubts about the second law of thermodynamics and the whole business of entropy, given that we originated in the singularity, in which neither time nor energy existed. Energy can be created from nothing, but let us not go there.

Professor Jowitt: Well, we will collapse into nothing if we do not do something about this.

Stewart Stevenson: Indeed, but let us really not go there.

The remaining question that is worth asking is whether the interim targets are good enough to motivate industries and get us to the kind of destination that, in a broad sense, we all see that we need to reach—particularly in the next 15 years, given that there are certain things that we need to deliver over the next 15 years that we probably need to have started already.

The Convener: Can we have very short answers to that question, please? We are running out of time, and a couple of members still wish to ask questions.

Fabrice Leveque: The interim targets will increase ambition. Speaking self-interestedly, I think that our industry will deliver most towards meeting them; it is therefore in our interests for this to happen, and it will help to drive investment. After all, if we are struggling to meet a particular target, it might help if we move it, because some of the things that we are not doing at the moment but that I have mentioned, such as new builds, district heating networks and rural heating, are absolute givens in a higher-target scenario. It would therefore help to pull through more activity.

Angus MacDonald: I am keen to hear whether you agree with the Government's approach in retaining an option to use carbon credits. How might they be used in, say, achieving the net zero target?

12:30

The Convener: Does anyone have any thoughts on that?

Professor Jowitt: I had difficulty in understanding that part of the bill, as it is rather obscure. I am really worried when we imagine that the future of the planet can be left to the market. That reflects the comments that I made earlier.

There is an element of that in offsetting and carbon credits. I find it slightly dishonest that we would be prepared to buy something from somebody else that would allow us to carry on behaving badly. It would be like donating money to a charity for fallen women while still using the brothel. It is not a road that I would prefer to go down. If we think that carbon is important, we should reduce our use of it; we should not try to pretend that we are helping the world by buying a few credits from some other poor country to help it to improve its lot. We should do that anyway. Our moral obligation is to help countries that are less fortunate than ourselves to get into a much better position. We should not be doing that on the pretext that we are helping while we continue to pollute the planet.

The Convener: The final question will come from Richard Lyle.

Richard Lyle: Is the panel content with the new approach to annual reporting?

Professor Jowitt: Do you mean the percentage bit?

Richard Lyle: The way in which annual reporting is done is going to change. The policy memorandum says:

> "the Bill rationalises the annual report produced under sections 33 and 34 of the 2009 Act so that it contains only information directly related to the outcome of the emissions reduction target for the relevant year."

The bill will change the way in which the outcomes are reported. Are you content with that?

Professor Jowitt: I am probably ambivalent about that.

Richard Lyle: I take it that you are on the fence.

The Convener: Perhaps your second question will be more relevant.

Richard Lyle: What are the advantages and disadvantages of annual sectoral reporting on the climate change plan?

The Convener: Let us imagine that the oil and gas sector had to report as a sector.

Will Webster: We have a lot of obligations to report the cost of using carbon in our processes. We already have a number of reporting obligations—I could give you a list, but I will not.

The key thing that we have to come to terms with is the implication of a base for the emissions trading scheme. That piece of legislation, if it is used in the UK, will significantly increase the cost of emitting CO_2 from our production processes and most of the other sectors that are covered. We have already seen the emissions certificate price go from around €5 per tonne up to €25 at one point, and it is now at about €20. That will be a significant cost for the sector, and there will be quite a bit of activity in dealing with it.

As well as the reporting requirements, these are the things that will drive different behaviours rather than the oversight of different pieces of legislation.

Dr Casey: Energy-intensive industries are already reporting into many different schemes. It is a massive burden; please do not burden us with any more reporting.

Richard Lyle: Perhaps I should report that my son works in the oil and gas industry in Aberdeen, just to keep myself correct.

Elizabeth Leighton: Taking sectoral reporting more for the climate change plan and how that has been broken down, it would be advantageous to have sectoral reporting so that we could understand progress against the targets. I presume that that would be supported by reports from the UKCCC.

Such reporting would also show how progress aligns with the budget. We need adequate resources if we are going to make the targets credible. There also needs to be a plan for corrective action if the policies fall behind what they set out to achieve. That has been a failing of previous climate change plans, even though the detail is useful.

I will comment briefly on the "achievable" targets. I hope that the committee looks at what comes from the UKCCC. You have asked for advice on the issue, and I presume that it will give you some advice on the interim and final targets. If it says that the targets are achievable, that will give some comfort that the Parliament is providing good leadership in Scotland and the UK, and to other parts of the world, in responding to the IPCC's report with targets that will address the challenge that has been set for us.

The Convener: That is a good note to end on. Thank you for all your evidence this morning.

At its next meeting, on 27 November, the committee will continue its consideration of the Climate Change (Emissions Reduction Targets) (Scotland) Bill by hearing evidence from the Cabinet Secretary for Environment, Climate Change and Land Reform.

12:36

Meeting continued in private until 12:46.

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