



Energy and Climate Change Committee

Oral evidence: [2020 Heat and Transport Renewable Targets](#),
HC 173

Tuesday 28 June 2016

Ordered by the House of Commons to be published on 28 June 2016.

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Members present: Mr Angus Brendan MacNeil (Chair), Glyn Davies, James Heappey, Dr Dan Poulter, Antoinette Sandbach

Questions 70 - 149

Witnesses: *Witnesses:* **Dr Jonathan Scurlock**, Chief Adviser, Renewable Energy and Climate Change, National Farmers' Union, **Dr Nina Skorupska**, Chief Executive Officer, Renewable Energy Association, and **Hugh Tucker**, Technical Director, UK Petroleum Industry Association, gave evidence.

Q70 Chair: Good morning. Thank you for attending this session on the 2020 renewable heat and transport targets. Can I ask you please, panel, first to state your names and organisations for the record, starting on my left?

Hugh Tucker: I am Hugh Tucker. I am from the UK Petroleum Industry Association.

Dr Skorupska: I am Nina Skorupska. I am the Chief Executive of the Renewable Energy Association.

Dr Scurlock: I am Jonathan Scurlock and the Chief Adviser on Renewable Energy with the National Farmers' Union.

Q71 Chair: Thank you. The UK's 2020 renewable energy target is 15%, with a sub-target of 10% for transport. The Government aims to reach 30% in electricity and 12% in heat. A number of targets there. Do you think these targets will be met?

Dr Skorupska: In a simple short word, no.

Q72 Chair: Why not?

Dr Skorupska: Essentially, the failure of the Government to appropriately focus on decarbonisation of energy outside the power sector. While the renewable electricity target is reported as being on track against all the policy and support mechanisms, the heat target

is woefully much lower and the transport has gone backwards. We have seen a number of actions come into play, which have hindered the progress of renewable heat and transport. I can go into some detail here but I am sure we will get into that a little bit later.

Hugh Tucker: I will pick up the point on transport and make my comments on transport. There are two targets here. There is the Renewable Energy Directive 10% target for transport. There is also the Fuel Quality Directive, which requires a 6% reduction in greenhouse gas emissions versus 2020. UK Power of course supports these targets and we will play our part in meeting them in a practical way and at the least cost to the consumer, while maintaining the nation's fuel supplies. The question of whether or not they will be met was discussed at some length with the Department for Transport's Transport Energy Task Force. That was attended by all stakeholders and I think everybody agreed that meeting the 2020 targets would not be easy, therefore we need a lot of flexibility.

For the Renewable Energy Directive, which in the UK is the RTFO, the DfT have advised us that we will need to blend 9.75% biofuels into transport fuels to meet the target. The rest of the target comes from electricity. Physically, we will not get 9.75% volume in fuels but we will endeavour to meet the target because renewables from waste and residues double count, so if you add 1 litre of waste-derived biofuels it counts as 2 litres of the obligation. To meet the 9.75% of the 2020 target, there is a heavy reliance on the availability of good quality double counting fuels and the ability to blend those into finished fuels. By 2020 we will need at least double the volume we currently have now.

Q73 Chair: We are hoping to cover that in a later section. We will pick that up. Any other—

Dr Scurlock: I would add that the NFU has been doing policy work particularly on transport biofuel, feedstocks. We see this as an opportunity for farmers to supply and for processors to invest in a domestic market, domestic production and processing and domestic production of the co-products that are also valued very much by agriculture. Going beyond that, there are opportunities in renewable electricity production for farmers, clearly, but there are also many opportunities in renewable heat production and we call upon the Government to have a more balanced approach to these things, rather than saying, "Well, we are doing very well on renewable electricity so we simply need not try quite as hard in these other areas".

Q74 Chair: In your balanced approach you would want the Government to do what specifically?

Dr Scurlock: It would be better to have rather more specific UK targets now for renewable heat and renewable transport, perhaps with some kind of eye on how much of that should be stimulating inward investment in UK production and UK processing.

Q75 Chair: What do you think the biggest obstacles might be in achieving these 2020 renewable energy targets?

Dr Skorupska: I think, even with the current policy set in place, if we look at just heat, the UK is fortunate to have the Renewable Heat Incentive, but even by the Government's own admissions it is only likely to support up to 9% instead of the 12% in terms of the funding that we have. We think even that is optimistic, based on the recent consultation around the

Renewable Heat Incentive, and we would estimate what would be delivered would be close to 5.5%, which then puts an even bigger onus on electricity and transport.

On transport, well, we have seen the RTFO has been capped for such a long time at 4.75% by volume. This should be increased to 6.5% in 2017 and then on a straight line trajectory to 10% in 2020. All other supporting frameworks have also been removed, which would have given a pull to this industry. As the Committee will know, in the last year we have seen something like 15 changes in policy and regulatory approaches. One simple one is the zero carbon homes, which would have been a perfect opportunity to enable renewable heat to be deployed more effectively in the new build programme, but this has been dismissed. Also, we have seen a tailing off of consumer incentives for EVs. So there is a whole raft of different support mechanisms or not support mechanisms, which are pulling the different elements of the rug from underneath renewable heat and transport.

Dr Scurlock: We could talk a little more in detail about some of the stuff in our written submission. We were particularly concerned about the recent review of the Renewable Heat Incentive programme, the change in emphasis away from biomass heating—drop-in replacement technology that works very well in much existing commercial and domestic building stock—and a change of emphasis and perhaps some rather inappropriate assumptions underpinning that. In the impact assessment DECC talks about biomass as a scarce resource. We do not believe it is a scarce resource, certainly not at the present time. There are many academic studies that support opportunities for domestic supply and, indeed, international trading of biomass energy commodities.

I think the other big misapprehension in this review of renewable heat is the expectation that one technology—heat pumps—can immediately replace any fall off in the deployment of biomass drop-in heating systems. Again, this is not the case. It is demonstrably so. People like the National Trust are very concerned that you can put a biomass boiler in an old historic building and use the existing wet central heating system, but you would have to tear that building apart were you to try to put in ground-source or air-source heat pump ducts. So one technology is not a replacement for the other and we cannot understand the rationale behind this rather abrupt change in direction.

Q76 Antoinette Sandbach: Of course the National Trust has the benefit of having had huge subsidies from the Government on a number of programmes that it has installed, and has forced membership to support the programmes that it undertakes in the housing stock it manages. But you said that you did not feel that biomass was a scarce resource. Of course, in relation to timber in the UK that is an issue. We are having to import huge amounts of wood pellets on a macro scale in relation to, for example, the Drax plant. Are you saying that there is sufficient supply of timber in the UK to support continued large-scale introduction of timber biomass?

Dr Scurlock: There are many biomass market opportunities, some of which are probably more appropriately served from domestic supply and domestic processing, others of which clearly are more in the international domain. Some of this is linked to things like product standards. For example, the standard of wood pellet required for domestic supply, stuff that maybe children and pets could be in contact with: it needs to be dust free; it needs to have high pellet integrity; it is produced to a different standard from the industrial pellets used by large people like Drax.

Antoinette Sandbach: I am asking about the resource.

Dr Scurlock: The resource is—and again I am a professional with 30 or 35 years' experience in bioenergy in the university sector, working both for the UK Government and the United States Government in the past—all academic studies support the idea that the biomass supply worldwide can be expanded many times with appropriate sustainability standards in place.

In the timber industry case, there are tensions between traditional users of resource and these new kids coming in on the block. Again, many studies say that this competition is manageable and that, in many cases, the same people who invest in panel board and timber products can also benefit by turning their very low-grade material into energy products.

Q77 Dr Poulter: You make the point—just picking up on the last question—about the number of studies that have been done to highlight the potential of the availability of biofuels. Are you aware that the UK Government has commissioned any study or actually investigated this in detail?

Dr Scurlock: There are many resource studies that have been carried out, some to support things like DECC's previous 2012 Bioenergy Strategy and a host of previous academic studies. I am the editor of a chapter in an Open University Press book at the present time: Oxford University Press is the publisher and the Open University is the commissioning editor.

Worldwide bioenergy use is currently about 50 to 60 exajoules—about 10% of world energy use—and there are many studies that have looked at the prospect of growing that to 100 or 200. The most optimistic studies suggest that 1,500 exajoules of bioenergy could be supplied worldwide. We do believe that this case has been made and demonstrated many times over.

Q78 Dr Poulter: What I am getting at is this: do you think that the evidence you have cited has been something that has been used to inform policy making by the UK Government?

Dr Skorupska: There was the bioenergy review back in 2012 and we do know that the Department was conducting a further updating of that review. We understand the BIAC study—the understanding of the counterfactuals of how you use biomass maybe from one country, process it, produce the fuel source and then transport it and utilise it in this country, what would be the conditions that would demonstrate that we meet the strictest sustainability criteria that we have here in the UK? That latest review revealed that good practices delivered and can use bioenergy resources from sustainable sources, and we can do that to support biomass power as well as—probably less so—biomass heat.

Q79 Dr Poulter: Absolutely, and that is very, very helpful. I am saying I understand your commitment to biofuels, and the strong evidence base that you say is available, but would you say that the current DfT consultation that is taking place on the crop cap would seem to reflect, for example, listening to that evidence base?

Dr Skorupska: If we are turning back to using biofuels, well, there have been two most recent reports that have tackled the view of—

Q80 Dr Poulter: No, I am asking whether you believe this is informing Government policy making in an effective way, or whether you think the evidence is not being taken on board by Government. That is what I am trying to get out. I understand there is very strong evidence but what I am trying to get at is: do you feel that this is being listened to by Government, taken on board and informing Government policy-making in the way that you would like to see?

Dr Skorupska: I think the evidence has been put before the committees involved in this. My team are absolutely engaged on that front but we still waiting to hear some information on a more recent consultation, which has not come out yet, for us to be able to comment on what would be the questions in that consultation. As to whether all of that evidence is being paid due regard to, we are waiting with baited breath for that consultation so that we can then comment and contribute to improving the policy around this area. We do need it happening as soon as possible; time is marching on.

Q81 Chair: With time marching on, that maybe brings us seamlessly to some of the implications of time and what has happened quite recently. The decision to leave the European Union may have implications for UK energy policy. What message would you like to send the Government in this period of—I think what is fair to describe as—uncertainty, given the renewable targets we are discussing today are set at a European Union level?

Dr Skorupska: I am going to jump in here because I feel very passionately about this. We sit here today with such uncertainty around what the energy strategy is going to be, but the UK is extraordinarily fortunate to have our Climate Change Act. A lot of that is predicated on our commitment to the EU Renewable Energy Directive targets for 2020. The third and fourth budgets incorporated all of that. I am not going to get into the discussion about what is going to happen with the EU ETS, and traded and non-traded and what that vehicle will be, but what we really need to see is not seen. Our recent report revealed across electricity, heat and transport there are over 117,000 jobs working in renewable energy. The Government cannot afford to row back on those commitments that they are already making in those pledges. That could be as part of the 15% renewable energy target, 12% for heat, and the legally binding—that is going to be the debate—10% on transport. It is possible whatever vehicle we move into, whether we argue we are going to be part of the European Economic Area, whether we will want to operate in the European Energy Union or even in the internal energy market. Some of the players who are in the internal energy market and not in the EU have to deliver renewable energy directive targets. They have NREAP goals just like we do.

Heat and transport in particular allows us now to invest in British businesses to deliver secure renewable energy in the future. It is a chance then to build investor confidence, if the Government does not row back on these commitments, so I urge you, as a Committee, to help us with that plea with the different Departments.

Dr Scurlock: The NFU has issued a statement as a result of the apparent determination to take us out of the European Union. We prepared two statements in advance, one for in and one for out, and there was remarkably little difference between the two. Either way, since we have a world leading Climate Change Act, since in the past the Government has certainly set out its stall saying, “We want to lead on decarbonisation and set a good example around the world”, there is relatively little difference in what we are calling for now for the Government: more consistency; more anticipation of technological trends in

energy storage, interconnection. The rolling out of these programmes, which are already well under way, whether you take away the European Union justification for them or not, really makes relatively little difference. We are already starting to demonstrate the potential of land-based renewables and we see this as a big income and diversification opportunity for the agricultural sector, in or out.

Chair: Thank you. I commend NFU on having the two statements ready, given the knife-edge that it was. I also meant to say that I have read the REA report and it is very good. I commend you for that as well.

Dr Skorupska: Thank you.

Hugh Tucker: From UK Power's perspective it is too early to say how this might impact the UK oil industry. We will be consulting with our members in the coming days and weeks. We will continue to engage with the Government on the priorities for our particular sector and how we might jointly achieve. UK oil refining is now more than ever vital to the energy supply resilience and mobility.

Q82 Chair: How might your members react or feel towards the result of the referendum?

Hugh Tucker: A number of members have put out individual statements but, as an association, we haven't yet consulted with all our members on what they wish to—

Q83 Chair: From what you know, what is the tone of their statements, are they welcoming or fearful?

Hugh Tucker: From what I understand, they are more in the line of “business as usual”.

Q84 Antoinette Sandbach: I want to move on to the transport obligation and, in particular, the 2020 targets in relation to that.

Dr Skorupska, you said that the UK is going backwards in transport. What measures do you think are needed to reach the 2020 target?

Dr Skorupska: The reason I said we are moving backwards is because we said in our report that we made 3% in 2014-15, and we need to increase the RTFO targets. We just need to raise that. The RTFO cap: the number at this moment is 3.8%, 4.75% by volume, and there is a long way to go. This should be increased immediately to 6.5% in 2017. Then, as I said earlier, let's show how we can have that trajectory and work around all the different elements that can contribute to it.

Renewable transport fuel is absolutely key, because we are very excited about the future of electric vehicles. We are so excited in the REA as well. We have created a sector group to look at how we marry electric vehicle deployment with energy storage, with solar, all the high-tech side. We are going to have so many fossil-driven or petrol-driven cars—if we start to ease away from diesel—all the way through to 2030. So it is about playing and ensuring work on both sides.

Q85 Antoinette Sandbach: Mr Tucker said earlier in his evidence that 9.75% was not achievable. Do you—that is the REA—agree with that?

Dr Skorupska: I have to say there has to be a clear plan of how we can progress that. If we come from the starting point we are at the moment, and not knowing what is in the consultation going forward, it is very difficult to say that we can achieve that.

Q86 Antoinette Sandbach: In relation to the Renewable Transport Fuel Obligation, you called in your evidence for it to increase gradually—as gradually as possible I think—because of unintended consequences. What unintended consequences do you foresee?

Hugh Tucker: The RTFO: we had a stakeholders' presentation from the DfT. DfT plans to increase the trajectory to 9.75 by 2020, which will meet the target. That is the biofuels volume versus electricity. As far as achieving that, there is a heavy reliance on the availability of good quality double-counting fuels, because to meet the 9.75 we will need to have double what we currently have today and we are already reporting—

Antoinette Sandbach: Sorry, my question was around the unintended consequences.

Hugh Tucker: Yes. I am coming on to that, if I may. We will need double the amount of double-counting fuel and we are already importing from more than 50 countries. If other member states also wish to use that, then we have an uncertainty about the availability of good quality double-counting fuel to meet the obligation for 2020. So we do have an uncertainty there.

In addition to that, the obligation set out in the current RTFO definition is more difficult than it needs to be, because the obligated fuel volume goes beyond that which is defined in the Renewable Energy Directive in that it includes all gas oil fuel, rather goes beyond transport fuel. The unintended consequences of that—coming back to your question—are that if those fuels are not available in the market then suppliers could be forced to buy out their obligation, which obviously would not be helpful because that would not achieve greenhouse gas savings.

Q87 Antoinette Sandbach: What is stopping the energy industry innovating and looking for technological solutions to that, rather than relying on the double-counted fuel?

Hugh Tucker: Today there are 30 million vehicles on the road. We can add 5% ethanol into petrol and 7% FAME into diesel and the cars are constrained by that. As oil companies that is where we are limited.

Dr Skorupska: We have to disagree here because—

Hugh Tucker: Therefore to meet the target you need double-counting fuels.

Antoinette Sandbach: I think I might try to ask the other panel members.

Dr Skorupska: We need to see the introduction of E10 as soon as possible. That would see an additional 1.5 million tonne of CO₂ saved. Cars can run on E10; 91% of petrol cars are warranted to run on E10 now. The number is increasing every year as the older cars are dropping out, so E5 will continue to be available—as Mr Tucker has mentioned—but for classic cars. Other countries have already moved to E10, E15 and E20. Therefore, what we need is the opportunity of a commitment to raise the amount and introduce E10 because that would then trigger UK bioethanol producers to continue to invest. At the moment what is at stake without that clarity is over £800 million of investment of UK producers,

who are wavering not knowing whether E10 is going to be a future opportunity for them or not.

Q88 Antoinette Sandbach: In relation to UKPIA's call for a gradual change you say, "No, we need to commit to E10 in order to reach the 2020 targets"?

Dr Skorupska: Yes, we do.

Q89 Antoinette Sandbach: What is the view of the NFU?

Dr Scurlock: We can bring vehicle manufacturers and warranty reinsurers with us. The technical barriers certainly do not exist. Twenty years ago I was at Oak Ridge National Laboratory. We had a US Government fleet of 85% ethanol vehicles manufactured by Ford with the approval of the American motor industry. I drove to the station yesterday in an Audi with a modification kit on it that enables it to run on 100% vegetable oil fuel. These are not insuperable technical barriers. There are institutional barriers perhaps that have to be transformed, but we entirely support this idea that we need to move to E10. We need a clear trajectory to 10% renewable energy in transport by the end of the decade, and the crops cap—limiting the investor choice in terms of feedstocks for processing these biofuels—should be set at a maximum permissible level of about 7%.

Q90 Chair: On the question of stability I am not certain myself. I don't know technically, but I have heard anecdotally of questions about the stability of road fuel when it has ethanol within it. Especially in rural areas, it might be stored for a while and break down. Has anybody heard anything along that line?

Hugh Tucker: Sorry, what is the question?

Chair: The question is about the stability of road fuel that might have ethanol within it when it is stored for a while, as it might be in a rural area where the draw down and the delivery of fuel might take a bit longer and there might be problems.

Hugh Tucker: Ethanol is added just before the fuel is delivered to the service station, so it is unlikely to be in storage for long.

Q91 Chair: If it is sitting in the service station, let's say, for two weeks, a month, would there be a problem?

Hugh Tucker: We would not envisage there would be a difficulty with that.

Q92 Antoinette Sandbach: In relation to the discussion on transport fuels, it is focused on ethanol primarily at the moment. What contribution will renewable gaseous fuels make—potentially biomethane, biopropane and hydrogen—in relation to the 2020 target?

Dr Skorupska: I think this is quite an exciting sector, it really is. In 2015, the UK was the fastest growing biomethane to grid market in the world. It was starting from a low base, of course, but it was growing pretty fast. There is a strong supply potential of biomethane and bio-SNG, with a potential of about 83 terawatt hours per annum, but we are lacking the vehicles at this moment in time. So, essential to decarbonising the gas network, I think we want to see the support for and the development of the vehicles. We have some great news stories of some of the major food supply supermarkets taking the step to have liquefied

natural gas, but the powerful aspect of that is when that is biomethane that is being used to drive the vehicles. We see it as essential for the heavy goods vehicle sector, as an opportunity there, so what we would be asking is for further support from the Government on the vehicles and the infrastructure.

Q93 Antoinette Sandbach: Clearly, the electrification of vehicles will not help in the heavy goods transport sector.

Dr Skorupska: No.

Hugh Tucker: Can I come back on a point on the E10? We are not saying we don't want E10. I did not disagree with you. I am just saying as of today there is E5. Whether E10 comes in—we have no objection to E10. The other point about E10—

Q94 Antoinette Sandbach: You have no objection to E10?

Hugh Tucker: No. They said they disagreed; we are not disagreeing. I just want to clarify that today we have E5. In the future if we have E10 that will give us more flexibility, but petrol is only 30% of the RTFO and diesel is limited to 7%. Therefore, to meet 9.75% across everything, we are going to need double-counting fuels and that is why my assertion is that we have a concern about the availability to meet the RTFO.

Q95 James Heappey: I want to speak on two things if I may, Chair. The first is following on from your question about Brexit, and perhaps seeing a positive as a driver for the greater take up of biofuels. It is predicted that if sterling continues to fall quicker than the price of oil petrol pump prices will become higher and, therefore, people might seek alternatives. Would you agree with that?

Dr Skorupska: I haven't worked out the economics around the arguments about what would drive people—sorry for the pun—to make those choices, or of how that would support it from a Brexit point of view. Who knows how low our currency will sink?

Q96 James Heappey: It must figure that higher pump prices are a problem for the cost of living, of course, but they do make people think about what the alternatives are.

Dr Skorupska: It does. Also a large proportion of what they are paying at the pump is fuel duty, so there are then choices for the Government whether to help negate those impacts if there is a perception that having bioethanol introduced into the price of the fuel would cause it to be higher. There are things to play around with here. I would love to talk to you some more about it.

Dr Scurlock: There was a great success in the past with the introduction of lead-free fuel, for example, through changes in duties.

Q97 James Heappey: Yes. Secondly, Dr Scurlock, increasing the rate of biofuels production within the UK is great, in that it creates an industry and I am sure farmers welcome it, but it would be interesting to get your thoughts on the impact that maize growth is having on flood risk and how we balance that.

Dr Scurlock: I have just been writing a policy paper for internal consumption in the NFU on very much that subject, but maize is not grown for biofuels processing. All our biofuels transport-fuel processing plants are looking at sourcing oilseed rape into biodiesel or

wheat into ethanol. Maize is grown predominantly in the UK to feed to dairy animals, particularly throughout the south-west. It has also started to be used now as a fuel for anaerobic digesters and concerns have been raised in some cases about tradeoffs between different farming users of the crop, as well as concerns about soil erosion risk where maize is poorly planted. I can assure you we are doing a lot of work talking to people like The Maize Growers Association on propagating, as far as possible, their best practice guidance, and making sure that we have the full support of the anaerobic digestion industry behind us here supporting their members to make sure that people supplying maize do adopt the highest possible standards in supplying that feedstock. Not all maize is used for AD and AD uses a lot of other crop feedstocks besides maize, so we do believe that this problem is entirely manageable. I think that is largely the conclusion of a recent paper that Defra had commissioned from Ricardo and ADAS, looking specifically into whether there was a strong evidence base here or not. They did not find one.

Q98 James Heappey: Thank you very much. We are going to move on to look at the future of the RHI and consider more broadly the supply of renewable fuels for heating. What is your assessment of the Government's proposed reforms to the RHI?

Dr Skorupska: I can talk about it in two parts.

We have biogas and biomethane members, which the RHI does also support. They are pleased with the proposed increase in the biomethane tariff to encourage the use of green gas for heating. It has been degressed aggressively. We are worried about the restriction of the use of energy crops, which is what Jonathan was talking about, and the removal of digestive drying as an eligible heat use and there are concerns over the future feedstock if that is curtailed, as under the banner of sustainability within the RHI.

On biomass, well, that is a very different story from our members. They are very concerned with the proposed tariff reductions for biomass—up to 61%—and the over-emphasis on large industrial heat at the expense of medium and small biomass systems. This would represent a loss of five years' worth of Government effort and investment to help build this industry and to help make sure it matures. We were just ensuring that quality standards of installations, training right across the whole education media, would be able to be built on the back of this. This reform has done nothing to revive the domestic biomass market, and that is being killed by the aggressive degression mechanisms.

We think the focus on large-scale biomass heat projects will not come in to bear. RHI is meant to give roughly a 12% rate of return over 10 years and a large scale, and particularly in this period of uncertainty—they are looking now for almost a two to three year payback and 12% is generous against these times, but they need to be seeing it happen so they would probably not choose to go down this route. They would probably choose to go down potentially the gas route, which would then lock in fossil generation and support and heating for a long time. Large biomass is a very difficult market to unlock and is not likely to be achieved.

I think our heat-pump members are pleased with the proposed tariff increases, particularly for air-source heat pumps, but there is a concern for the heat demand limits that make domestic systems for larger properties unaffordable, without making systems for smaller properties more affordable and limiting the overall deployment.

Our geothermal members are happy that the reform provided needed uncertainty for that. But the place I have the biggest beef with is with the DCLG who have just sat on their hands in terms of planning, unable to deliver this opportunity. I hate to say that shale gas has got in there first. Shale gas rode on the back of helping geothermal by saying, “We need these planning wayleaves for horizontal drilling, but now we need to see this actually being recognised for deep geothermal. We have been put to the back of the queue”. I have evidence to support that.

Q99 James Heappey: Just explain that connection for me again. I am not sure I understand it.

Dr Skorupska: Deep geothermal, in the way that it progresses, does horizontal drilling as well and it needed—just like the shale gas industry does—permissions in planning for the wayleaves, so you don’t have to go and talk to every single property owner.

Dr Scurlock: It is the underground drilling access consultation.

Dr Skorupska: It is the underground drilling, yes.

James Heappey: I see.

Dr Skorupska: Thank you, Jonathan. About 18 months ago we were approached: would we be a co-signatory with the shale gas industry to help propose these wayleaves to come to bear? We said, “Well, we are not so keen but, okay, this gives us the planning access” and now we are not seeing any further progress for the deep geothermal industry.

Q100 James Heappey: That is interesting. The Energy Saving Trust told the RHI that the consultation seems to be putting a very strong emphasis—in the domestic scheme at least—on heat pumps at the expense of biomass. Is that something you agree with and, if so, is it a problem?

Dr Skorupska: Yes. It is. There has been a choice of technology, a reapportioning of where the Government feel—and how—they want to support renewable heat, hence massive cuts to domestic biomass and also saying that the focus for biomass should be on larger scale for non-domestic. It is a very tricky topic because there are horses for courses in terms of property. Many of our properties—as the Energy Saving Trust will probably have said to you—are inefficient in terms of energy efficiency. Therefore, the amount of supportive investment that you are going to need in order to deploy heat pump technology would be quite a large amount of money. Biomass suits certain properties and people with those properties should be allowed to have that option to use biomass as a way of delivering renewable heat, rather than the Government dictating what proportion should go where. The example of the National Trust was, given, and while they have a lot of support I agree, they are technology neutral. They have gone round and looked at their properties and where they can fit heat pumps, ground source, air source, they do but where they cannot they have to fit biomass—because they want to—but they have been told that they cannot, essentially.

Q101 Antoinette Sandbach: Can I just correct that? They can fit it but not with subsidy.

Dr Skorupska: I give way on that point.

Antoinette Sandbach: Thank you.

Q102 James Heappey: It is best not to argue.

Dr Scurlock: the NFU has said that it is hard to see how the biomass boiler supply chain can adapt to the pace that is now proposed by DECC. Can you expand on what the NFU was saying there?

Dr Scurlock: We recognise that, according to DECC's statistics, about 30% of the uptake of RHI—and 90% of this is biomass heating boilers in the non-domestic sector—has been in the agricultural sector. We know—again, from talking to our own members, talking to our specialist advisers—that, yes, it is people with large poultry sheds, horticultural units, pig units and so on, who find this, just like the National Trust does, a rather convenient drop-in replacement technology. It fits their business needs. They were embracing it enthusiastically. They were part of the market pull that was helping to drive the supply chain and the skills base on delivering small and medium-sized biomass heating units, just like every other European member state has been experiencing of late. So, we cannot comprehend the rationale behind it or the determination to suddenly shift gears and push the market off in a completely different direction. It is going to be very harmful and it is now going to limit, clearly, the opportunity for our members to carry on with these upgrades.

Q103 James Heappey: I have been very impressed with the stuff I have seen locally back in Somerset of AD producing biomethane that is in many cases rather wastefully being used to produce electricity; it would be so much better if it were able to get into the gas network, but the gas network does not extend far enough in many cases to be able to get those connections. What do you think we need to do in order to hit the Government's target for biomethane into the gas grid? What are the big things that need to be changed?

Dr Scurlock: The Government does not have a target specifically for biomethane. Some of the concerns here do relate to what you were saying earlier about soil erosion risk or supply chains that are growing perhaps rather inappropriately large around very large AD plants. Immediately after this meeting we are going off to see the Defra Minister, Rory Stewart, to talk to him about on-farm anaerobic digestion. We believe that the best outcome possible would be for Government policy to support a wide range of applications from the smallest farm-integrated AD plant at the one end—which may well indeed be a combined heat and power unit meeting onsite needs—through to the opposite end of the spectrum, where appropriate, with these opportunities for large biomethane upgrading plants, which may be using food waste or they may be using crop feedstocks. To some extent, we do need to unshackle these market opportunities and discover, shape and regulate this industry rather than constraining it overmuch by making possibly wrong assumptions.

Dr Skorupska: Also it is a fantastic opportunity. We have been working hard with our members who see biomethane to the gas network as a way of decarbonising the gas network. It is an extraordinary infrastructure that we have available. It is one of our biggest energy storage facilities as well. Barriers that have been put in place, sometimes the regulations of how an anaerobic digestion plant needs to connect to that gas network, as if they are trying to produce the equivalent of Birmingham gas volumes when we are

talking about a small AD—so, it is about working around our hard-won safety regulatory aspects to understand what is appropriate for ensuring that this technology moves forward.

Q104 James Heappey: Do you detect that that is an opportunity so scalable that the Government should be thinking very hard about how to make sure that the gas connections are available for these AD plants to—

Dr Skorupska: I think a plan or a strategy would certainly serve as encouragement. The other thing that has also deterred joined-up thinking is that the AD industry grew with Feed-in Tariffs. That came along first. Then the RHI came along, and we are now also seeing the opportunity of people tapping into the gas network to fuel their heavy goods vehicles. We need to catch up with all of these different developments and create a more complete, cohesive plan, so I would support that.

Q105 James Heappey: Finally then, if the Government could do one thing to ensure the UK meets the 12% target for renewable heat by 2020, what would it be and why? It is like an X-Factor question.

Dr Skorupska: Don't undo all the good work around biomass—well, sorry, I am going to pinch two, and that is an X-Factor response as well. In the response to the consultation, which is still open, we know they are listening to us. DECC are listening to our members. We have had good conversations. The biomass industry has grown and it is such an opportunity for British industry to now be delivering secure renewable heat and investing in our own here.

The other aspect is waste, and food waste. This is one of the topics we will be talking on later. In another arena we are not making the best of all of our resource. In Scotland and in Wales they have moved to 100% separation of food waste and collection. I mean municipal waste separation. In England we haven't. Less than 45% of local authorities do some form of separation. That is a fantastic opportunity. Our recent report shows it can save costs and be a benefit to local authorities. Is that okay; I pinched two?

James Heappey: That is absolutely fine.

Dr Scurlock: I think we would largely second what you have said, Nina. Do not undo all the good work in the small and medium-sized biomass supply chain in particular. But I think there are other opportunities for the Government perhaps to look again at its previous anaerobic digestion strategy and reformulate a new one now for the latter part of this decade.

Hugh Tucker: We have no specific covenants on the RHI as such except that any mechanisms that are developed should be on a technology neutral basis, and the greenhouse gas savings achieved should be developed on a lifecycle basis so that you can see the true value of what is implemented.

Chair: We will go to Dr Daniel Poulter. I am not sure if he has the X-Factor or not but we will leave it with you, Dan.

Q106 Dr Poulter: I want to draw out a bit more your thoughts on the sustainability of some of the policy making, but also the future framework for the development of biofuels. Biofuels are often considered to be carbon neutral. How accurate a statement do you feel that is?

Dr Scurlock: It is a little bit of a bear trap to say biofuels are completely carbon neutral, because we know that inevitably in many supply chains some fossil fuels and other greenhouse gas producing inputs are part of a more complete lifecycle analysis. But in many cases I think the biofuels industry has perhaps surprised its critics in showing quite how much greenhouse gas savings it can achieve with well regulated supply chains.

Q107 Dr Poulter: Just quickly before we go to Dr Nina, would you say that it implicitly follows that there is a reduction in the savings we can make in terms of carbon emissions if the UK is more reliant on imported biofuels?

Dr Scurlock: You have to look at entire supply chains in the round. There is no simple answer to that, yes or no. As domestic producers we would like to say that perhaps there is greater confidence in the provenance of UK-sourced feedstocks, and that we should have greater confidence in investments in biofuels processing on our own shores, but we understand that clearly this is a world market and that Treasury, and other decision-makers within Government, may be looking as much for value for money in decarbonising as building a domestic supply chain.

Q108 Dr Poulter: It is impossible to make generalisations but, as a generalisation—I know we have to be wary of that when we are looking at the evidence base and, quite rightly, where the sourcing and the processing of biofuels are going to have an effect on the potential carbon savings that can be made—would you say that it is more on the carbon neutral side and it is more carbon neutral if we produce our own biofuels as opposed to importing them? Or is there not much difference?

Hugh Tucker: The Renewable Energy Directive sets out clear rules on carbon sustainability and there are a number of European schemes, voluntary schemes, that are used to check that. It varies according to the fuel and how it is processed and how it is developed. There are schemes to check out exactly what the carbon savings are for each biofuel.

Dr Skorupska: Maybe I can turn your question just slightly. We require all our members to demonstrate, through appropriate evidence, that their fuel meets the minimum greenhouse gas savings and is from sustainable forests and land use, full stop. That is what we have to do. Your question is asking if local is better than international trade. But it is about the scale of the challenge that we have to meet here in terms of greening our electricity, heat and transport as well.

Q109 Dr Poulter: I will pick up that point because, as an answer to my previous question, one of the other members of the panel made the point about wanting the UK to have more incentives in this area. It is a natural follow-up to ask, understandably, for you is that because you believe that this is good in terms of reducing carbon emissions? Or what was the reason for that comment if we are in a global market here?

Dr Scurlock: We would all probably agree that perhaps instead of just having thresholds that we had to meet it would be great if low carbon fuels were rewarded in terms of their carbon footprint. That would perhaps be a stronger incentive to better quality reporting, regardless of international or national provenance.

In terms of looking back at our research base, some of the recent information that has come out of a project in which ADAS and others have been involved with called MIN-NO, looking at nitrous oxide emissions associated with the production of a number of different types of crops or different types of land use, we have been able to demonstrate now on UK field sites that these emissions of greenhouse gases are somewhat lower than the international default values often used in this kind of lifecycle analysis. That would suggest perhaps that there would be a small but perhaps demonstrable UK comparative advantage in procuring those feedstocks from domestic resources. But at the moment, anyway, if you meet the minimum threshold, it really does not make any difference in terms of meeting that requirement.

Q110 Dr Poulter: To clarify, would you say that the evidence, as you understand it, from what you have just described is that there is a small advantage from the perspective of producing emissions from using UK-based biofuels as opposed to internationally sourced biofuels?

Dr Scurlock: There is an opportunity for UK processes using UK feedstocks to demonstrate that they can meet more challenging targets. Internationally we know for a fact that Brazilian bioethanol from cane has a very low carbon footprint. That perhaps is the standard that we all ought to be trying to beat with advanced biofuels. But we are never going to get to advanced biofuels if we do not have a thriving biofuels industry here in the UK in the first place.

Dr Skorupska: I second that point. If we turn to biomass heat, developing biomass heat actually incentivises and benefits our forests, bringing in the undermanaged forests. Everybody thinks that we are chopping down every single tree in this country to fuel our biomass heaters, but there are many forests that could be managed more effectively. The Forest Commission themselves are responsible for protecting and expanding Britain's forests, and manage nearly 1 million hectares of public forest. Coal biomass heat is a win/win/win for UK forests. You can look at this in so many different ways. Everything is down to the supply chain, the management and good practices and that is what we need to work towards.

Chair: That is a point we will bring out. Antoinette Sandbach has one point.

Q111 Antoinette Sandbach: Yes. I want to come back on the forestry issue. Yes, there is undermanaged forest or woodland, small parcels of woodland on farmland, but the evidence is that a lot of that woodland is disappearing and being destroyed and being used in biomass boilers. Yes, there are opportunities for the Forestry Commission but, in terms of their management, we have seen phytophthoras run rampant through UK forestry. There were huge problems in Wales where they had not controlled the disease. Certainly, looking at forest waste, in other words the brash that is left behind after you have extracted your timber, there does not seem to be much use for that at the moment. Experiments to look at the use of brash—and I know because I was involved in one of those—meant that when they looked at burning it for biomass it did not have the right quality or sufficient thermal heat to generate. At least that was the experience in North Wales.

Dr Scurlock: In a former life I worked with the Forestry Commission in something called the community forests in north-east England. We did extensive work looking at the Scandinavian experience with brash harvesting. The Finns in particular have done a very

good job on this. I think, in terms of fuel quality, no, it is possible to get good quality fuel out of forest brash. The arguments largely do relate, though, to things like good forest management. Under UK conditions in many cases you require the brash mat in order to avoid soil compaction and damage from the harvesters and for heavy equipment being used.

Antoinette Sandbach: I do manage an FSC certified forest, so I do know a bit about it.

Dr Scurlock: But again we would emphasise there is an opportunity here, particularly in some of our more wooded parts of Britain—which surprisingly are not necessarily in the north of England, they are in places like Kent—for farm woodland to be better managed and in many cases to be managed for energy purposes, bringing with it then perhaps further benefits in terms of public amenity access, and biodiversity. All that is required is to have a good woodland management plan in place. That is something the Forestry Commission very strongly recommends.

Q112 Dr Poulter: I have a couple more questions on the biofuels issues.

In 2015, as we know, new rules came into force through the EU Indirect Land Use Change Directive. One of those was setting a crop cap that was set at 7%. However, individual member states can set a level up to 7%. Now, the DfT are consulting on what level the crop cap should be set at later this year. They have modelled a 1.5% cap, which they have said—this is from their taskforce—“From a carbon cost effectiveness perspective, a 1.5% crop cap appears most desirable”. Now, you are shaking your heads. I would like to take your views and thoughts on that because earlier on I think there was a little bit more optimism from Dr Nina about this, and the opportunity to input into the Government consultation. But we have what appears to be a position statement and a 1.5% position being taken, subject to the consultation, and I just thought it would be useful. Can I ask Mr Tucker to come in quickly please, because we haven’t heard from you for a little while, and then I will come back to Dr Scurlock?

Hugh Tucker: One the question of crop cap, in my opening remarks I talked about flexibility in achieving the target. I have also talked about our concern about double-counting fuel being available in the market. If the crop cap is set very low, and there isn’t any double-counting fuel available in the market, what are the fuel suppliers supposed to do? Therefore, we feel that for flexibility the crop cap should be set at or close to the directive level to give us the flexibility going to 2020. Now ILUC is a very important question and it needs to be looked at but, as far as getting to 2020 is concerned, we consider the crop cap should be at the directive level or very close to it.

Q113 Dr Poulter: Dr Scurlock, do you have anything to add to that?

Dr Scurlock: Well, we cannot understand the rationale for setting a crop cap at 1.5% and saying that this is going to be somehow optimal. Farmers at the present time are facing low commodity prices again. It is cyclical. At the moment many farmers would like to have an increased opportunity for lower-grade grains to go into biofuels processing and to thereby also increase UK supply of the animal feed co-product, which comes back from that processing. We have a deficit in quality animal feeds. Animal feeds are a large input cost to many agricultural businesses and we do not really see why we should be so

dependent upon Argentinean soy when we could be producing that co-product here in the UK.

Dr Skorupska: I have been told by my staff to say it would be a disaster to set it at 1.5%. Essentially, it will undermine what we already have here in the UK. Fuel suppliers could choose whether to meet their obligation. We buy diesel or ethanol and, unless the Government suddenly says this entire cap—whatever it is that they will set it at—has to be filled with UK home-grown bioethanol, that will be the end of the UK bioethanol industry. I mentioned earlier that over £800 million is invested in supporting 45,000 jobs in that area. What if two times the amount of waste-based biodiesel is not available, which is the point my colleague has been making? So we will not meet that 7.6% target for the UK.

It is also an opportunity not to put that cap in because the majority of the fastest growing electric vehicle fleets are petrol hybrids. There is a greater opportunity to help with that decarbonising the petrol element with bioethanol. So, officially we want 7%—that is what the EU has said, 7%. Obviously we would love 10% but there you go.

Q114 Dr Poulter: I think it is fair to say that there are concerns expressed across the board about the direction of travel that may have been indicated by the DfT consultation and, perhaps more seriously, the Government is looking at biofuels in terms of long-term policy making—I see some nodding—and obviously you would value that.

My final question is picking up on the point you made earlier. You have a meeting with one of the Defra Ministers later on today and the non-domestic RHI, Renewable Heat Incentive, consultation suggests promoting biogas from waste-based feeds rather than crop-based feedstock. That sounds reasonable, or does it not? I am going to put that over to all of you perhaps to make a case and an argument about the reasonableness of that suggestion.

Dr Scurlock: Both in its RHI review and in this recent review of Feed-in Tariffs for AD, the Government has largely been looking at evidence around the cost effectiveness of maize as a feedstock. It is then proposed, on the strength of that, to say we want to have a ban on all crop feedstocks. I said earlier that there are many other crop feedstocks available beyond maize. Maize just happens to be one of the most convenient things for many farmers to put into their rotations, but the AD industry itself is already growing beyond just reliance upon that one crop.

DECC has given an option 2 in both of these consultations saying, “There will be a limit on crop-based feedstocks in terms of the biogas output, rather than just a complete ban”. We are very clear to try to exercise damage limitation here by pointing out a number of sources of feedstocks for AD from perennial grass, from land in environmental management, from land that may be taking a silage cut off and then being grazed by livestock later in its annual growth. So, multi-purpose land, land in environmental management and other crops, which are not maize, if maize really is the culprit here—we believe that all of those should be not subject to a restriction and that, indeed, the right option for DECC to enact here would be its so-called option 2, rather than the complete ban.

Q115 Chair: Thank you. A quick follow up on that. A number of times you have talked about importing fuels. I think Argentina and Brazil have been mentioned. Where else are

biofuels likely to come from—America, China? What are the main import areas that biofuels could come from?

Dr Skorupska: Biofuels? Well, the one area—

Dr Scurlock: Liquids rather than other bioenergy commodities?

Chair: Yes, liquids.

Hugh Tucker: Waste fuels come from more than 50 different countries. I am sure Nina will have—

Q116 Chair: There is no one particular country that leads exports?

Dr Skorupska: Not that I am aware of. Would you mind if I just look to my experts at the back? Do you know?

Dr Scurlock: Brazil and the United States are the two largest producers worldwide but there are many significant producers elsewhere: Thailand, China.

Dr Skorupska: I have been informed that it is other EU countries and the Ukraine.

Hugh Tucker: They are in the UKPIA statistics and we would be happy to send you a copy afterwards. We have a breakdown of all the countries and where the fuels come from.

Q117 Chair: Thank you. I am aware that time is pressing because I know that two of our panel members have to leave by 11.00 to go to see Rory Stewart over at Defra. So I want to know, do you think the system of incentives for renewable fuels ensures that land is used efficiently and that fuels are put to the best use across the different sectors of electricity, heat and transport? Are there incentives there that ensure that efficiency?

Dr Skorupska: As we will see in terms meeting the carbon budgets that we want to aim for, there is still work to be done. As I indicated before—

Q118 Chair: If there is work to be done, what could the Government do differently to achieve that level of efficiency?

Dr Skorupska: I think that whole system approach of aligning across the different Government Departments, of looking so that what we are doing for electricity, what we are doing for heat and what we are doing for transport is all joined up. We have seen some positive work with the set up of the Office for Low Emission Vehicles, which is bringing together DfT in strong links with the other Departments. Also we need Treasury to be absolutely au fait with everything that is going on, so that they are an enabler rather than a hinderer when we need to ramp up the support. As we started at the very beginning, renewable heat and renewable transport are way behind in terms of delivering on our commitments. Are they all joined up? No. The fact that we do have good support mechanisms in some areas should be good examples of how we can join up the other mechanisms to deliver that whole system approach.

Q119 Chair: The UK Petroleum Industry Association has suggested levying some system of trading renewable energy credits across all of the sectors. Hugh, how would you see such a mechanism working?

Hugh Tucker: In terms of trading certificates across the sectors, if you wanted to make it joined up—as Nina has said—greenhouse gas is greenhouse gas so, therefore, if you generate a kilogram or a tonne of greenhouse gas in one sector, it could be redeemable against another sector. So if one sector does more you could redeem certificates against the other, so you could bring the target down that way.

Q120 Chair: Would that idea be generally supported across the panel here this morning?

Dr Skorupska: Oh—

Chair: Sorry to put you on the spot but it is what we do.

Dr Skorupska: We are working hard just to get green gas certificates taken on board, so that as our fledgling AD industry injects biomethane into the gas network companies are aware of how they can buy certificates when they extract from it. It is working but it is still a long way off. We need to see that build up, but if there is a strategy of working towards that by 2020 I will sign up for that. It is going to be extraordinarily difficult and I would like to say probably more difficult at these particular moments in time.

Dr Scurlock: The most effective cross-sectoral policy tool we could have would be a carbon price that was actually high enough to act as an incentive. We are a long way from that at the present time.

Chair: Thank you for that. I don't think there are any further additions to that. Panel, can I thank you very much for coming along this morning? I am aware you have to be out of here in four minutes so your time has been appreciated and I hope I did not make you too nervous by keeping you as late as we have. Thank you.

Examination of Witnesses

Witnesses: **Stewart Reid**, Head of Asset Management and Innovation, SSE, and **David Manning**, Director of Stakeholder Relations, SGN, gave evidence.

Q121 Chair: Thank you, panel, for attending our session this morning on the 2020 renewable heat and transport targets. Please, as ever, can you first state your names and organisations for the record?

Stewart Reid: Yes. I am Stewart Reid. I am the Head of Asset Management and Innovation for Scottish and Southern Energy Power Distribution.

David Manning: My name is David Manning. I am Director of Stakeholder Relations for SGN. We are a gas distribution network, the second largest in the UK and we operate the network in Scotland and in the south of England.

Q122 Chair: Thank you very much both of you. This is a question you might have heard before. The UK's 2020 renewables target is 15% with a sub-target of 10% for transport. The Government aims to reach 30% in electricity and 12% in heat. Do you think these targets will be met?

Stewart Reid: From an electricity network's perspective, our position is we need to be ready for it being met and ready for it not being met. There is a lot of uncertainty in the world. There always has been, and it is our job to be ready for these different scenarios. You will hear later on about some of the things we are doing to be ready for that position.

David Manning: I would say that we have the capability and the competency to achieve the targets. What we are lacking at the moment are robust market signals and incentives that are going to ensure that they can be achieved and, as we look at the timeline to 2020, time is getting very tight at this stage.

Q123 Chair: You have mentioned uncertainty, which of course leads us seamlessly to the decision to leave the European Union and the implications for the United Kingdom in improving their energy policy. Is there any message that you would like to send the Government around this period of uncertainty, given the targets and interlinking we have had with the European Union on many of these developments in this area over the years?

Stewart Reid: On the electrical vehicle front, from our perspective there has always been uncertainty in terms of electric vehicles in terms of uptake and acceptance. From that perspective it doesn't change much and behind the scenes we have a robust business model to allow for that uncertainty. We are relatively comfortable that we can survive that uncertainty for a period of time. The thing that we need to be sure of is that we make sure that things move on and become stable sooner rather than later so that we can have the dialogue with all the appropriate organisations and particularly the suppliers and vendors that will be suffering uncertainty themselves in these times.

David Manning: I think we are fortunate here in the UK in the energy sector in that we have a very robust Act that gives us a very clear target that we want to achieve by 2050. Certainly our 2020 targets are more related to EU-based interim targets, but what we do today lays the foundation for us to be able to achieve 2050, so I don't think we can afford to take our foot off the gas based on what might or might not have happened last week.

Q124 Antoinette Sandbach: In terms of heat electrification, heat pumps seem to be the primary focus of the Government's strategy. Is this a fair assessment and what contribution will the Government's heat electrification strategy make to 2020 renewable targets?

Stewart Reid: Heat electrification is a key part of it. Our role is to be ready for the different scenarios and understand how they are going to impact. One of the things we are looking for is there is not necessarily a focus on just one solution, whether it be in the transport or fuel sector, but that there is a fit-for-purpose blend of solutions that can be applied across the country to help us to meet the targets.

David Manning: When we look at energy demand, at peak energy demand in a given day, 80% of heat load is met by gas and in that environment we need to be thinking very clearly about how we can utilise this very valuable asset we have in the ground—the gas distribution network—to continue to meet that.

There are parts that are not connected to that gas network, because they are very remote for example, and that is really where electrification will come into its own and the value of heat pumps really starts to kick in. Electrification is also going to be quite important in very densely populated areas where maybe it is not suitable to put gas, say into high-rise buildings.

Q125 Antoinette Sandbach: David, SGN's evidence and in fact your evidence just now, has been that the most appropriate way to decarbonise the heat network may be through electrification—particularly in rural areas, because they are all off-grid—but I do not know if you heard the evidence from the previous panel around AD plants. Do you think that there may be a role for more localised AD in those rural areas?

David Manning: What I would refer you to on is a look at the Scottish Independent Undertakings, which are off-gas-grid areas that operate independently of the main network. If you have areas where you have anaerobic digestion being produced and you have the scale and the capacity—the number of customers basically—where you can build a network cost effectively and feed anaerobic digestion, producing biomethane, into that, then that seems reasonably logical. It would once again have to come back to the economics of it. What you want to try to deliver is the most cost-effective solution for the customers. One of the things that we will always try—and I know Stewart will as well from his side—is to always concentrate on what is in the best interest of the consumer. So you want to deliver something that is going to decarbonise but is going to decarbonise in the most cost-effective way for that person. So we just want to be fairly certain of the options.

If you look at what we are doing at the moment we have had this very successful growth of anaerobic digestion, a fledgling industry, but we have gone from no plants in 2012 to 65 producing biomethane. We are starting to see that taper off a little bit now and the reason for that is because of RHI, and the degressions that we have changed. I would like to remain optimistic that we will continue to grow our industry, but in order to do that we need to be quite careful to make sure that the incentives are adequate and we can keep delivering that.

Q126 Antoinette Sandbach: For those off-grid areas, what about air-source combined with gas boilers because of storage constraints?

Stewart Reid: It does not address the gas boiler part of your question, but we have been running a project on Shetland called the NINES project for a number of years now and what we have there is 1.5 megawatts worth of domestic electric heating using storage heaters, but advanced storage heaters. That 1.5 megawatts matches itself with the local renewables and we have been able to increase the local renewables on that island by over 10 megawatts by matching the electrical heating to the renewables, and that gives a community benefit with community-owned renewables. It is a really great synergy, if you like, in that it drives down the cost of running that location and reduces the carbon content. The key thing there is if you are going to be using heat and electricity then it needs to be controlled, so you need to have your demand-side management or response in there as well. That is the secret ingredient.

One of the issues with heat pumps is they are not quite as flexible, unless you design them with that in mind from day one, so you integrate thermal mass with them, so you have that

control. If you have that control it becomes part of the solution rather than part of the problem, and that is what we have been doing on Shetland and in other places.

Q127 Antoinette Sandbach: In terms of the impact of heat and transport electrification on the grid, SPEN has told us that electricity demand in the UK will be flat until about 2023 from when it will rise by 1% to 2% annually due to electrification. Does it follow that the increasing electrification of heat and transport is unlikely to have impacts on the grid up until 2020?

Stewart Reid: There are a lot of variables in that. It links into the uncertainty we were talking about before. One of the things worth pointing out on the transport side of things is that it might not be Government policy that drives the uptake in electric vehicles. It could be, believe it or not, consumer choice. So this is what I was getting back to earlier on, about the uptake of electric vehicles; there are a lot of variables in there and our position is to be ready for that, even if it is just about consumer choice because electric cars become the better thing to have than a diesel or a petrol car. So there could be a disconnect between Government policy and what happens in reality. That could in theory apply to heat as well, depending what happens in the bigger environment.

David Manning: I think what you will find as well is that 20% of emissions in the transport sector is associated with heavy goods vehicles, even though they are only 3% of road usage. So when we talk about electrification you are talking a lot about the domestic electrification of cars, whereas the movement of goods requires a different solution. If we look at what the possible options are, compressed natural gas, which would substantially reduce the emissions in that sector, is starting to look like a real option. One of the questions the Committee has asked is this piece around holistic approach. You can envisage a world where you have a refuelling stop that is a combination of your electric charging, maybe a little bit of traditional petroleum-based products, but then also this CNG-type of product that the gas industry can then provide in that area. It is going to be a portfolio of solutions. You cannot just say it is one thing that is going to solve everything. It is going to take a little bit of everything.

Q128 James Heappey: How do the impacts of the heat and transport electrification programme break down between the transmission network and the distribution network?

Stewart Reid: I don't have a breakdown per se of that available but we can have a look to see if we can provide some figures along that line.

What I can tell you is the My Electric Avenue project is a project that we initiated in 2011, when we realised that electric vehicles were going to provide us with a challenge at the domestic-charging end of the equation. We went to Ofgem along with the ETL and a number of other organisations, including Nissan, and we proposed a project to roll out electric vehicles in clusters.

One of the issues we have—this is why the question you asked is so difficult to answer—is the clustering effect, by which I mean if you drive through a town now you will see areas where there are lots of solar panels and you will see areas where there are no solar panels. They cluster, and it is sometimes behavioural, sometimes economic. There are different reasons as to why they cluster, and that clustering creates little points of stress on the electrical network. In the project we want to understand what things trigger these

clusters and how we can predict where these clusters are going to appear so that we can respond in advance. You could get a scenario where a relatively low uptake of electric vehicles results in a lot of intense clusters, each of which requires investment.

Q129 James Heappey: It has been suggested to me by some people that are working in R&D on exactly this sort of thing that the answer is that you embrace the clusters; you embed storage not in the premises, not at network level, but at substation level, so that you can buy out those peaks in generation. Is there any serious thinking being given to this?

Stewart Reid: We are doing that now; what we have is a range of interventions you can take on. The first intervention is the one we have done with My Electric Avenue. All networks are designed for only a certain number of appliances being on them at any one time but there is a lot of time with spare capacity in the network. The problem with electric vehicles is that you plug them in and they are on for several hours, so the chances of them all being on in one street are high. What we have done with My Electric Avenue is develop a device that goes into a substation, monitors the total impact on the network, and shares the charging-out through the night in such a way that when customers come out in the morning all their vehicles are charged but at no time have they all been on and overloading the network. That is an intervention that requires electronics, a bit of comms and a bit of demand-side management.

The next level of energy we are starting to talk about is integrating energy storage. We have street batteries in the Thames Valley area—we are trying at the moment to understand how they free up capacity—and the idea is that we are in a position where we have relatively low-cost interventions that we can put in place that free up additional capacity in our local distribution network. It is £2.2 billion if we don't do that, if we were trying to respond to—

Q130 James Heappey: That dynamism is very encouraging and I agree it is the only way to make it really work, but to what degree can that dynamism be achieved if we don't achieve a full or significant rollout of smart meters and therefore the digitisation of the system?

Stewart Reid: That particular solution, the sharing of charging, does not use smart metering, as it stands. Smart metering is designed more for large geographical groups of areas being managed, whereas this is a specific problem on a specific street, on a specific cable. It is a small number of customers so you just put a plan of intervention to that group of customers, and that leaves smart meters to do the overall balance.

Q131 James Heappey: So if you extrapolate that cellular vision of managing peaks in demand and peaks in generation that come from distributed generation and the electrification of systems, and take that cellular model forward, does it mean that smart meters are yesterday's solution to yesterday's problem, and this is the way to be going now?

Stewart Reid: I would say no to that. I think the clustering—I don't have a percentage in terms of what percentage of the country will be covered with clusters—but it will not be everywhere, especially in the early days. The clusters are starting to accumulate and the rest of the network will not be benefiting from any balancing service. That local management of demand is to manage the low voltage, the local network, in your street. You also have a problem on the high voltage network, which is all of these small networks

joined up. Smart meters can play a role in helping to balance that, and that is an important contribution, a different layer of control.

Q132 James Heappey: How much does it cost you to be able to install that device and substation that allows you to manage that?

Stewart Reid: We have a strategy in place now first to get a standard established for this technology that has been developed so that we can procure it, rather than being tied in with one vendor, and part of the Low Carbon Networks Fund ensures that the IP is available and all the rest of it. So our estimate would be below £1,000 to install a substation and £100 or so per home to put the intervention in.

Q133 James Heappey: Say that again. That is £1,000 per substation to do it or—

Stewart Reid: Where you have a cluster, the expectation is about £1,000 to do the substation work, and a few hundred pounds to do the work on the individual homes.

Q134 James Heappey: How do you envisage that cost being borne? Do you see that as a cost for the person installing the generation capacity, or do you see that as a cost that is divided among all households?

Stewart Reid: When it comes to normal, domestic electric vehicle charging points being connected, any impact on the network is socialised, so the individual purchasing that electric vehicle would not be carrying the cost of that. It would be socialised, and what we are trying to do is avoid the next worst scenario, if you like, which is digging up the street, overlaying cables and replacing transformers and the like, which as you can imagine is very disruptive.

Q135 James Heappey: This is exactly the great problem. Here is progress, it is what we must do, electrifying heat and transport makes sense as much as it decarbonises, but there is potentially quite a big cost in achieving the infrastructure to do it and how that is borne has to be a pretty serious consideration.

David Manning: Yes, and I think we need to be a little bit careful about it. A lot of the narrative over the past five years has been very driven around the electrification of X. The reality is that we have this very valuable infrastructure asset in the ground, which is the gas pipes, which has been invested in and renewed over the past 10 years, to the point that our network that we operate in Scotland and in the south of England is now more than 70% polyethylene. What that gives you is something that the customer has already paid for and that can flow any composition of gases through it. At the moment we put natural gas through that system, but that is not to say that over the next 20 to 30 years we can't migrate that gas into a portfolio of different things, which includes biomethane, it can include bio-SNG, moving rapidly towards hydrogen as we get towards 2050 and the decarbonisation of that. The reason that is a sensible option is because if 80% of energy demand at peak times is currently met by gas—which is four times more than the capability of electricity—you would have to make a hugely substantive investment into electricity, both on the network side and on generation capacity, in order to bridge that gap. That is going to cost the customer an awful lot of money, whereas you already have an invested-in asset that you can utilise and diversify.

Q136 James Heappey: Thank you very much indeed. My final question: I have met with car companies who think that electric vehicles are brilliant, but despair of those of us who are in energy policy making and energy lobbying when we talk about electric vehicles as being the storage solution for the grid. They are not quite so sure that the cars they are building are meant to be batteries from which power is taken. To what degree is the vision you are building assuming that electric vehicles are going to play that role?

Stewart Reid: We are taking quite a pragmatic approach to this. The challenge here is that we suddenly have to face a very large number of electric vehicle clusters on our network and we have to spend a lot of money, so we are trying to find ways of minimising that and being ready for it. Vehicle to grid stuff, as far as we are concerned, comes after that. It is not going to make things worse, that is one thing we are pretty confident about, and there are a couple of DNO projects being started as we speak, looking at that sort of technology.

Q137 Dr Poulter: Coming on to a few questions about green gases, and biomethane injections into the gas grid, how effective do you think the policy is in encouraging that in working towards the 2020 renewable heat target?

David Manning: I will answer that in two ways. If we look at the potential, the capability, at the moment you have about 3.5 terawatt hours of biomethane being injected into the system. At the back end of last year DECC published its own report that indicated at least 6 terawatt hours; the capacity and the capability was there to deliver that. There is a very substantial opportunity for biomethane to make ever-increasing contributions to meet the 2020 target.

If I revert back to what I started with, if you look at 2012, 2013, 2014, 2015, you had this quite substantial uptick in interest by investors to look at biomethane and invest in that capacity. Then we as a company, SGN, have been a very strong advocate and facilitator of getting that biomethane injected into the system. So by the end of this year there will be 65 biomethane production plants in the UK, of which 22 of them, one-third of them, will be injected into the SGN network. We were one of the first companies to support this on a commercial scale at Poundbury back in 2012.

What we have seen, though—this year in particular as depressions have kicked in and we are now going into our third depression at the moment in coming back off the tariff—there is a very significant fall-off in interest. So we are at 3.5 at the moment, and we have the potential to get to six by 2020, making a very substantial contribution to the renewable heat target. The market signal is diminishing rapidly, and what we would want to see from the RHI consultation that is out there at the moment is a resetting of the tariffs back to January 2016 levels. The reason I am picking that out is that DECC themselves have said, “If we see a fall-off in interest in developing biomethane then we will raise the tariffs back up”, but the problem with that is that creates a huge amount of uncertainty. It is almost as though there is recognition built in—“We might have pushed this too far and we are probably going to have to go back to where we were”—so would it not make more sense to ensure that investor confidence is maintained, to deliver tariff levels at January 2016 levels and see that biomethane production being invested in and delivered?

Stewart Reid: One of the things I will say is we have done a project up in Aberdeen that was using an electrolyser to take excess renewables from the network in that area and produce hydrogen, with the specific purpose of injecting, so it is really important to

understand there is a link between the two energy sectors, that vector. It does not come out of a lot of international studies. The seasonality of the weather in the UK is an absolutely critical part of this and the whole point being made about the mix between gas and electricity is absolutely key. If you live in a Mediterranean area, you have the same weather every single day, the sun is up, and you can charge your electric vehicle 365 days a year. The issue that we have in the UK is that does not unfortunately happen every day. So, as you mention, gas gives you that potential for storage as well, and it gives you that additional flexibility. One of the things we would be asking for is not to back one horse when it comes to transport and to think about that seasonality and how you can store that energy rather than require everyone to have it instantaneously. That is when you would strain the network and these assets that we have, the gas and electric network, one or other of them would not be getting fully utilised.

Q138 Dr Poulter: In terms of projects in the pipeline, looking at the 2020 target, do you feel strong support from Government for these gas projects and is it your understanding that there are a number of other projects in the pipeline at the moment?

David Manning: On the biomethane side?

Dr Poulter: Yes.

David Manning: I think that DECC absolutely has to be commended on the quality of the RHI and what it has succeeded in delivering in the short term, in the past few years, but certainly in the work that we are doing and from the developers that we are talking to there is an ever-creeping uncertainty into whether projects can go ahead at this stage, based on their financial viability and capability with the depressions that have been seen in RHI.

Q139 Dr Poulter: Okay, so you have concerns going forward about future projects?

David Manning: Our piece in this is we operate the network; we flow natural gas in the network. What we want to do is to diversify the energy source that is flowing through, and today biomethane is a very reasonable, very high-quality product that we can put into that network that is going to green the gas. So we would like to see developers having that sort of certainty for themselves so that they can continue to develop plants that can then in turn get injected into the network.

Q140 Dr Poulter: On the hydrogen side, the hydrogen injection into the gas grid is a longer-term project. What would need to change in terms of the UK's gas pipelines and other related infrastructure in order to facilitate that hydrogen injection?

David Manning: As you said, just to emphasise the point, if we think about ourselves on a trajectory to 2050 and the greening of gas, biomethane and SNG are the near-term solutions, then hydrogen is the slightly longer play. Hydrogen in its own right is not new. Sometimes we think these ideas are the new fancy toy, but town gas of the 1960s was 49%, 50% made up of hydrogen. Effectively what we are looking at is going back to a previous composition of what gas was made of.

Because we have been going through this process of renewing the network over the last number of years we have this very resilient polyethylene-based distribution network. What that means is it is relatively, bar a little bit of modification, fit-for-purpose to put hydrogen through that pipe. In partnership with SSE we did a project last year called HyHouse

where we looked at whether the network could be operated safely with increasing proportions of hydrogen in it and the answer back from the question was yes, it could, with that increasing amount of hydrogen.

From a policy and Government standpoint, a lot of the focus will need to be on the upstream side: the supply of hydrogen; the production of it.

Q141 Antoinette Sandbach: I am sorry to interrupt you mid-flow, but when you said that the existing network will work effectively with that change in hydrogen, does that also mean that the end products using it—boilers, cookers—will need adaptations, if you are putting that in, as opposed to the main infrastructure?

David Manning: No, so what I referred to there was the main infrastructure. In terms of the boiler and appliances within the home there would be certain changes or standard changes that would need to be made to them, and the reason for that is the burning of the flame. Basically, the flame does not quite burn as strong and so you would need a slightly different injector capability. But if you think about the time horizon that we are talking about you could introduce CE standards now that would mean that appliances that would be going into the home over the next few decades will start to become increasingly hydrogen-ready. It is a little bit like when TV went from analogue to digital; you can start to bring that in. That is in the consumers' home and there is a natural churn of appliances within the home as they come to end-of-life and you put in a new appliance.

Going back to the point on the upstream side, Government and policy need to think about how they are going to work with the upstream industry to start to deliver the production of hydrogen, and there are a couple of different ways of doing that. It is thinking about how we can develop that out further—if Ecotricity were here I would think one of the things they would say is, “We have this very robust network of wind farms. We use excess power from wind farms on a windy day to split water, which gives you hydrogen and oxygen”—and about how we develop that technology and how that will work for the long-term.

Stewart Reid: That is exactly what we are doing in Aberdeen. The hydrogen from Aberdeen is going into buses. There is a small fleet of buses being run there, and it is working very effectively from an energy balance perspective. What you will find is if you drive past a conventional power station today on a warm summer's day a lot of them will be switched off. In just the same way, a lot of the time renewables could be turning, they are not turning. Using that marginal cost, grabbing that energy and utilising that to produce hydrogen and putting it into the transport sector is something that could be done sooner rather than later as well. That again is dragging as much value from the renewable assets as possible and accelerating decarbonisation.

Q142 Dr Poulter: The Gas Safety (Management) Regulations, among other things, are designed to ensure safe gas flow through the network. There is some thought that we have seen as a Committee that these regulations have become outdated. I think you have a project in Oban at the moment. Is that a fair view? Maybe take us through that project as well.

David Manning: I am going to jump to the Hippocratic oath and go, “First do no harm”. In terms of a business that does what we do; we absolutely want to ensure the safety of our customers, so that is number one. There are gas safety regulations that underpin that.

The standard of gas that is used is based on North Sea gas, so that particular chemical composition of North Sea gas, and what we looked at in Oban was saying, okay, within that band, within that specification was there the capacity to broaden it a little bit to allow other types of gas into the network without having a negative consequence for the customers' appliances in the home? Oban is a Scottish Independent Undertaking; we met with all of the community and we visited each of their homes. We went in and audited all of their appliances. Where an appliance was absolutely at the end of its life, beyond redemption, we replaced the appliance for the customer. Where it was found to be in any way faulty we repaired it. That gave us our base sample. Then we started to introduce different compositions of gas into the network at different times and monitored what impact it had on the customers' appliances. What we were pleased to see was that it had no negative consequence, so that has two benefits to it. The first one is if we look now at the North Sea gas specification it is different from the European gas specification and we import that into the UK and then we treat it to bring it up to the UK gas specification. That costs around £325 million per annum. What this project has proven is that you can broaden the specification without having to do that £325 million investment in up-spec-ing the gas. So that is a potential annual saving to the customer. The second thing that it showed is that you can bring in higher penetrations of green gas into the network to a certain threshold, but similarly not having a negative consequence on the customers' appliances at the back end as well. That is what the Oban project has proven, and at the moment we are speaking with the relevant authorities to ask them to look at the evidence that we produce at Oban and ask them to consider broadening the index as it sits at the moment, with the commensurate savings for customers at the back end of it.

We were very pleased last year to have been awarded by Ofgem under their innovation fund, NIC, for a project that is called Real Time Networks that we are delivering in the Medway towns. What we are doing is we are putting very sophisticated sensors into the pipe network so that we know at any particular point in time in that network what the pressure flow is, what the composition of the gas is, and so on. What that allows us to do is on a minute-by-minute basis manage the flow and quality of the gas in that network. That means that we can manage it much more efficiently to the cost-benefit of the customer, but what we can also do is at any point in time know if there are any problems with the network before the customer ever knows that there is a problem, and we can get in there early, make an intervention and get the problem fixed before it ever has a negative impact for our customers.

Q143 Chair: Thank you. I was just going to say I think Oban was the first part of the UK mainland—or the Scottish mainland, whatever you want to call it—that I saw when I was six years old when I left the Hebrides. I think I was pretty sick and pretty glad to see Oban when we got there.

Moving on to the matter at hand, Scottish Gas Networks told us there is currently an opportunity for some joined-up thinking on how the different elements of the energy system can be brought together. What would taking that opportunity entail?

David Manning: This comes back to this whole systems approach and hopefully what you will have received from what Stewart and I have said is that there is a lot of interlinkage here. The first thing is, we do talk an awful lot about electrification, and that absolutely has a substantial role to play, but it is electrification plus how we can utilise the value of

the gas network; it is how the two of them can complement each other that will deliver in the best interests of the consumer. That is at one level.

At the next level you can look at the area of transport—I have spoken already about this combination of electric vehicles—but also then for heavy goods vehicles you can look at how compressed natural gas can be used as an option. Then if we break down into the even more local area we can talk about things like district heating.

A district heating source is more than likely going to be a combination of a CHP unit—a combined heat and power unit installed in a new development with the heat network attached to it for the benefit of customers—but as a CHP unit it will also be producing a huge amount of electricity that can then be exported on to Stewart’s network, which can also be used for charging electric vehicles or whatever the case may be.

We made reference in our submission to how at the moment we tend to think a little bit in boxes; a little bit in silos. The indication of what we were trying to signal in that language was there are opportunities where policy can link each piece of this and say, “Okay, well, that and that add together, so let us see how we can drive the two of those forward”. I have given you a couple of examples of what that looks like.

Q144 Chair: Sometimes when there is the thought of policy changing there can be a feeling I can imagine from people like yourselves that policy can be too slow in reacting. Do you ever find that frustrating, particularly in this area?

David Manning: I think if we look at where we want to get to by 2050—

Chair: Specifically I could ask what changes you would like to see coming from Government. What policy and legislative changes would you like to see?

David Manning: From a policy standpoint I am going to ask for two things. The RHI has seen quite a lot of degression, a lot of value taken out of it. Biomethane is a genuine solution that can deliver for renewable heat by 2020. Let us not force it into a market where investors just are not interested in investing in it anymore. That is the first thing.

The second thing comes out when I compare our Scottish network to our southern network. Under Ofgem’s rules I look to help fuel-poor customers, and I do that by providing them with a fully subsidised gas connection. So when someone has been proven fuel-poor, I give them a gas connection. In Scotland then the same fuel-poor customers can look to the Government and say, “Okay, can I get some support to put in a central heating system or to change out the boiler?” and there is a support mechanism there, whereas in the south, it is not that there isn’t one, but the degree of support is much less.

Taking that point and extending it, there are 9 million boilers still left that are old, not condensing heat boilers, so there is a real opportunity to turn around and say, “Okay, let’s bring in a boiler scrappage scheme that is going to replace those old 9 million boilers with new, high efficiency condensing heat boilers”.

Q145 Chair: You are talking about the south here?

David Manning: Yes, but the 9 million is UK-wide. The 9 million is not just specific to the south, so I am just linking the two points that say we can look at Scotland and see how

successful that is in replacing old boilers and helping out fuel-poor customers, whereas here in the south you can see why it is not as successful here, and then in addition to that point to hit your heat targets for 2020, if you can swap out those 9 million really inefficient boilers you are going to do two things—you are going to help customers because a far more efficient boiler is going to be cheaper for them to run, and secondly you are going to substantially reduce your carbon emissions associated with the older boiler. What I would like to see is some form of boiler scrappage scheme that is going to help those customers. They would be my two big policy pieces today; the RHI and how we help those customers swap out their boilers.

Q146 Chair: Thank you. That is very specific.

Stewart, SSE argued in its written evidence that action to meet short-term targets must not undermine or take priority over long-term considerations to sustainably decarbonise the UK's heat sector. Why is there a trade-off, do you think, between the short and long terms?

Stewart Reid: I think probably it is unintended consequence. If in trying to stimulate a change in an uptake too rapidly you create an impact that you then have to start to backpedal from; that is probably the piece there. It comes back to this piece I was talking about earlier; making sure we have that balance and that portfolio of solutions, with transport, for example, with electric vehicles or hydrogen or other forms of green transport. We need to make sure that we are pushing all the buttons at the same time rather than waiting for them to come all at once.

Q147 Chair: Do you have any specific examples on the earlier point there of the short term and the longer term in conflict with each other?

Stewart Reid: Looking backwards you could almost say that the uptake in Feed-in Tariffs, for example, and the very high levels of uptake in some areas, missed the opportunity to put some of these other things in, like increase in demand in parallel with the uptake of Feed-in Tariffs. There were some cases in the past where for all the right reasons the market has been pushed, but it has been pushed and left the other half of that solution behind. There is a danger that we do similar things, if that makes sense.

Q148 Chair: If there is anything else that occurs to you please can you send it in, in writing, afterwards?

Stewart Reid: We will do.

Q149 Chair: Thank you. The final question: will both heat and transport need to be fully electrified by 2050, or is there a role for gas in the long-term? It is a long way out and I think I have a feeling what the answer might be given what you said about polyethylene pipes, but I am asking the question anyway.

Stewart Reid: From my perspective it will be much more difficult for the electrical network to deal with the challenges if the gas network is not being fully utilised at the same time. So it makes an immense amount of sense to try to work with the two together.

One of the things we are seeing more and more is that these are complex systems we are now creating—with a lot of factors—so the DSO, the distribution system operator role, is going to be fundamental. What is happening in practice is it is starting to appear on the



system anyway. I mentioned Orkney—we have an active management system on Orkney—and we are sending out signals to bring renewables off when the network cannot use it, but these signals are now also going to inform people about when they charge their electric vehicles, and it is also going into some projects where it is going to be initiating heating systems, thermal stores and the likes, to be charged. That is a DSO function and if you introduce gas into that as well in the future there should be areas where we are actively trying to encourage customers to take a gas solution as opposed to an electric solution, or an electric as opposed to gas, to get the maximum out of the assets that the country has invested in, let's face it, over the years.

David Manning: Everything Stewart said, and just to add to it, if I look at it from a customer perspective I am very accustomed to the convenience of my gas coming into my home, and 85% of customers in the UK are connected to it. I also have a distribution system that is paid for, so there is no incremental or additional cost associated with that in terms of other solutions. What I would hope today is that I was able to articulate to you a vision of what can move through that pipe over a trajectory between now and 2050; so you have a good chunk of biomethane, you are looking at bio-SNG and then hydrogen is a thing from the past for the future. So you have a vision of where you can get to, to decarbonise heat by 2050, combined then with the piece that Stewart talked about on electrification.

Chair: Thank you very much and I think you reflected in your answer there on the convenience of gas. I live in an area where there is no mains gas but I have a bottle of Calor Gas at the gable end providing that gas for cooking at least.

Thank you both very much for coming in this morning—it is much appreciated—and thank you for your time.