

Environmental Audit Committee

Oral evidence: Technological innovations and climate change: heat pumps, HC 896

Wednesday 25 November 2020

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Members present: Philip Dunne (Chair); Duncan Baker; Mr Robert Goodwill; Marco Longhi; Cherilyn Mackrory; Jerome Mayhew; John McNally; Dr Matthew Offord; Alex Sobel; Nadia Whittome.

Questions 1 - 48

Witnesses

I: Emma Pinchbeck, Chief Executive, Energy UK; Dr Jan Rosenow, Director of European Programmes, Regulatory Assistance Project; Randolph Brazier, Head of Innovation & Development, Energy Networks Association; and Dr Howard Porter, Chief Executive, BEAMA Ltd.

Examination of Witnesses

Witnesses: Emma Pinchbeck, Dr Jan Rosenow, Randolph Brazier and Dr Howard Porter.

Q1 Chair: Good afternoon, and welcome to the Environmental Audit Committee. Today we are having a special one-off oral evidence session, in our technological innovation and climate change series of inquiries, on heat pumps and the role they may play in helping the country to achieve the net-zero Britain ambition.

We have four witnesses today and I would like them to start by introducing themselves. A regular at this Committee to start, Emma Pinchbeck.

Emma Pinchbeck: I am Emma Pinchbeck. I am the chief executive of the energy industry trade body, Energy UK. In the context of this inquiry, we are interested on two counts. First, the energy industry is fundamentally the delivery body for the Government's net-zero commitment and will underpin every single change to the economy that we are anticipating, and that goes for decarbonisation of heat, too.

On the consumer side, we are interested in new technologies that will be going into consumer's homes and into the transport system and how my members can offer even better energy services to our customers.

Dr Rosenow: Good afternoon, I am Jan Rosenow and I represent the Regulatory Assistance Project. I am the Europe director and we have no association to any particular technology. We are more interested in understanding how we can decarbonise the entire energy system. Taking a systems perspective, we have done a lot of work on clean heating recently and, in particular, the impacts of electrification of buildings.

Randolph Brazier: Good afternoon. My name is Randolph. I am head of innovation at the Energy Networks Association. We are the trade association for the gas and electricity networks at transmission and distribution in the UK and Ireland. We fully support the rollout to net zero and think networks are one of the key aspects to achieving that, including the connection of heat pumps to our local distribution networks.

Dr Porter: Good afternoon, I am the CEO of BEAMA. BEAMA is a manufacturing organisation. In the context of today, our members range from the manufacture of grid equipment, which they try to sell to Randolph's members, to smart meter equipment, which they try to sell to Emma's members, plus all the electrical equipment in buildings, including heat pumps, hence why we are on today.

We also cover related technologies for clean heat, including underfloor heating, smart heating controls, ventilation equipment, energy storage and electric vehicle charging equipment. We have a full range of interests in this, but today the focus is on heat pumps and the role they can play.



Q2 Chair: I will kick off the session by trying to put some context around the potential role for heat pumps. Emma, you are probably best placed to start. The Committee on Climate Change indicated that it believes heat pumps are the best means of delivering decarbonisation of our homes, which accounts for a very significant part of the energy usage in the UK. Could you put that into some context for us? Why is it that heat pumps have been identified as the solution?

Emma Pinchbeck: There are about 29 million households in the UK, of which about 23 million are currently heated with gas boilers. The Committee on Climate Change is targeting net zero by 2050, which gives us 30 years to decarbonise the entire economy, and heat is one of the biggest challenges within that. So, 30 years to decarbonise heat. That gives you the context for 750,000 installations of heat pumps per year to 2050. It is seen as a ramp up to that number over the next decade.

There are a limited number of heat decarbonisation technologies available, or at least that we can see—and I will come back to available in a second—those are things like hydrogen boilers, heat pumps and district heating that can have a variety of technologies on the end.

What is absolutely key is to understand that there are only a certain number of technologies available right now and, given that ramp up rate and how quickly we need to decarbonise, there is a clear view that we need to go with what we have and do it. That is the first reason that heat pumps have been identified as key because we have them already. There are very good markets for them outside the UK and we know we can do it.

The second thing to think about is Jan's point that this is a whole economy, whole system transformation. As well as thinking about the right technology in the right building, we also need to think about the right technologies in the energy system. Every technology has its advantages and disadvantages, but heat pumps are interesting because they are flexible and electric. Therefore, they fit in a world where you have electrified transport and flexible offshore and onshore wind and a large scale of renewables on the other end of the system. In that whole context, we think they are the cheapest solution for the industrial revolution that is coming on net zero.

Dr Rosenow: Just to add to what Emma said, which I agree with fully. It is also the high efficiency of heat pumps that makes them particularly interesting. You put in about one unit of electricity and get about three units of heat out of your heat pump. That is much more efficient than a typical gas boiler, which would usually have an efficiency of maybe 90%. You have an efficiency of 300% on average, which makes this a very compelling proposition and minimises the size of the energy system as a whole.

When you think of where all the energy has to come from, a lot of that will need to come from renewables. By using heat pumps you minimise



the amount of capacity needed and you minimise the amount of infrastructure needed. That is one very important reason why heat pumps are very interesting as an opportunity for decarbonising heat.

Q3 Chair: Why are they so unpopular among householders at the moment? I think 1.7 million gas boilers were installed in 2019, but only 27,000 heat pumps. Why is that?

Dr Porter: I am not sure I would agree with the word “unpopular.” I think unknown is probably a better expression. I live in Watford. If you asked most people in Watford what a heat pump is, you would get a very strange look. They would think it is something to do with a car or I don’t know. Basically, there is a complete lack of understanding of the technology. In fact, I have heard that the term “heat pump” is off putting. It is a bit too technical. That is part of the challenge we have.

Let’s face it, if you are on the gas network that Emma referred to, the country was converted to gas boilers when I was a young lad, some time ago. In the late 1960s, 1970s, that is when gas boilers became the de facto heating system in the UK because natural gas in the North Sea was coming onstream. It was cleaner than town gas, and I am sure at that time the Select Committee was recommending clean gas boilers because it was the most obvious thing at that time.

We have a situation where all consumers, all householders, have had a gas boiler for the majority of their adult lives, or in fact their whole lives, therefore it is not surprising that it takes some time to make a conscious decision, “I will do something differently.” That is the technology they have been used to. It is a little analogous to fossil fuel cars. It has taken many, many years—and we are not quite there yet—in the transition from fossil fuel cars to electric cars because everybody has been driving a fossil fuel car for 30, 40, 50 years.

Q4 Chair: Emma, you touched on comparative performance in other countries. I understand Scandinavian countries have been far more in the lead on this issue. Our neighbour, France, installed five times as many heat pumps last year as we did. Can you point to why that is? Is there a wider recognition that this is a good thing in France?

Emma Pinchbeck: There are two points to make on this. The first is to follow up on your previous question because it is related. That is to say that I have members, energy retailers, suppliers and those offering energy services, who are desperate to install heat pumps but currently cannot do it because it is impossible to create the consumer proposition. Before even being able to have the conversation with consumers, we need to know it is going to be financially attractive to install them.

The important thing to note about the UK market, in particular, is that the way we have constructed policy means that all the price signals in the market point to a gas boiler as being the most sensible technology to install. There are a number of things Government could choose to do



about that. In new builds they could look at our home standards. We could look at VAT, taxation or business rates in non-domestic properties. For domestic consumers we could sort out our market so that we can offer flexibility services for one thing but, also, look at where the policy costs fall on energy bills.

There are a number of things we can do. If we did those things, there would be almost parity between heat pump costs and traditional boilers. That would enable suppliers—who, let's face it, are very good at talking to customers about energy use—to start having those conversations and to take some of the pressure off Government to fund and deliver the rollout. This is something the market can help to do. That is the first thing.

The second thing is to think about the UK's unique context in terms of our building stock. We would like to see better co-ordination between the fabric of our buildings, energy efficiency policy and heat. These are two sides of the same coin. As Jan said at the beginning, the attraction of heat pumps is that they are very efficient in how they use energy, but what helps them be efficient is for our buildings to be as efficient as possible. That is a difference with other markets that we could look at.

Just a statistic: one of my members pointed out to me this week that in some markets the cost of heat pumps is 50% cheaper than we are currently delivering them in the UK. There is a huge potential for cost reduction.

Q5 Chair: That is very interesting, and we are going to come on to costs in a moment. I should have declared an interest, in that I have a property with an air-source heat pump in it and I looked at putting an air-source heat pump into another property that was being renovated and the cost was more than double—I am off gas grid—the oil cost to capital installation, which meant it was unaffordable.

That gets me to my last question to the group, and I know Randolph wanted to come in and has not yet. Perhaps I can ask you this question, Randolph: Government have some support measures that have been in place for a number of years with the Clean Heat Grant, the Renewable Heat Incentive and now the Green Homes Grant. How effective are current Government support mechanisms in helping to deliver take up of heat pumps?

Randolph Brazier: Historically, they have not been that successful but we hope they will be with the Green Homes Grant that because there is a focus on heat pumps. There needs to be incentivisation for the flexibility with the heat pump. Just the heat pump by itself will not be enough for some of the reasons Emma said. We have to have associated flexibility, whether that is from the building—if you seal the building, it allows the heat pump to act more flexibly, which not only reduces the cost for the user in terms of energy but also reduces the network cost. It can significantly help us. Also, there could be some sort of incentive for



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storage alongside it, some sort of thermal storage alongside the heat pump, because it is not always possible to retrofit the homes. Energy efficiency measures can be quite disruptive, which can lead to some of the unpopularity that you were indicating.

The only other thing I would note—more from a personal perspective—is that, as you can probably tell from my accent, I am from a country where heat pumps are very popular and most people heat their homes using some form of heat pump. That goes back to Howard's point about education. If people get used to them and understand them, they are really cool, they are easy to use and you can save a lot of money with them.

Q6 Chair: Which country are you referring to?

Randolph Brazier: I am originally from Australia, where we heat our homes using effectively a reverse cycle heat pump.

Dr Rosenow: Your question was how effective current schemes are. It is important to explain what those are, briefly. The Renewable Heat Incentive has been the main delivery scheme for heat pumps in the UK. That has been in play since 2014. The original goal of that incentive was to subsidise about half a million homes to switch from fossil fuel heating to clean heating.

How many have we delivered so far? I checked the statistics in preparation for this hearing. We have not even done 100,000. The National Audit Office thinks we are getting a little more than 100,000, so a bit more than 20% of what the impact assessment that DECC—as I think it was when it was designed—suggested. We have not achieved that target.

Looking at the Clean Heat Grant, which will replace the RHI, the ambition there is broadly similar to what we currently deliver. I checked again what the annual installation rates are and what the Clean Heat Grant is doing, and it is pretty much the same. There is a very small variation. It is basically supporting the market as it already exists.

What that suggests to me is that we cannot rely on a purely demand-led scheme. There were subsidies available—fairly generous, when you look at the RHI—but people have simply not come forward, I think partly for the reasons that Howard pointed out. People do not know about this technology, but also the convenience and the economics of gas make heat pumps a more difficult choice for customers. That is important when we discuss what else is needed. Simply providing more subsidy is not going to solve this problem quickly enough.

Q7 Chair: We have an enormous challenge to achieve the Government's ambition of a 20-fold increase of annual installations and to run that for 20 years. Something significant is going to have to change.



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Dr Porter: I gave this some thought. We are looking into the future. In the next two or three years, it is difficult to see how this market will expand without some, if not all, of the Government incentives in place. I say that for the first two or three years. We have a situation now where the RHI is due to finish in April 2022 and go into a straight grant of £4,000. We now have the Green Homes Grant, which is very welcome. It would have been helpful if there was a little more notice because the impact on heat pumps is going to be less than it would have been, because the installers are not in place and were not trained. It came in very quickly. It is very welcome, but it is a bit too rapid into the marketplace.

Now it has been extended, and I believe the funding for that has been confirmed in the spending review today. That is great, but at the moment we are looking at a situation where, just when we are trying to expand the market for heat pumps—let's take ourselves forward 18 months to April 2022, at which point the grant goes down and the RHI, which gives the income for seven years for householders, stops.

That is probably the worst time to stop that initiative. It may well be fiscally beneficial to stop it, from the Government's perspective, but if you are trying to make a massive market transformation, which is what we are talking about here, it is the wrong time. Where I would agree is that one cannot survive on Government help and subsidy in the medium to long term—absolutely correct—but we probably need it for more than 18 months.

The sort of thing I would suggest—and I am sure the other witnesses would agree to help here—is that it would be helpful to outline the project from a consumer's perspective. Philip, in your example you mentioned putting in an air-source heat pump off the gas grid. What are the real economics of that, particularly if you put it in the context of green investment from the finance industry? What is the typical interest rate you would get on that? What would you get from RHI? Ultimately, if one went for storage and a technology called demand-side response, which is the flexibility that Randolph was referring to, you end up in a very different financial and environmental picture than purely, "Let's take out an oil-fired system and put in a heat pump." That is a very important step, but the overall picture of economics and environment is very different than that black-and-white situation.

Q8 Dr Matthew Offord: Dr Porter is probably the most appropriate to answer this question. Everyone has a budget, and everyone has to take into account the cost of living and everything else. After Philip's example, how can we encourage people to install heat pumps, particularly when they are more expensive than conventional gas boilers?

Dr Porter: First of all, we have to seriously answer the question: again, in the short to medium term, are we focusing on the on-grid market or the off-grid market? A bit like Philip, I have a second home. We are



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taking out an oil-fired range and putting in an air-source heat pump, so very quickly I will know the economics.

There is a combination of the stick and the carrot, classically, in all these things. The fact is that off-grid, oil-fired boilers—I am not sure I would use the word “banned”—will certainly not be encouraged in two or three years’ time. I know, speaking to the installers in the real network where we are doing this work, they are only doing air-source heat pumps. They are doing no new oil. You could argue that in the off-grid market, this is already beginning to happen. It may not be happening quickly enough, and there may need to be more incentives, but the incentive of the Green Homes Grant is certainly helping in the off-grid market.

Maybe it is worthwhile looking in a number of years, when we need to consider how to convert the gas grid. It gives us some time to work out how best to do that if we concentrate on those off the gas grid in the medium term.

Emma Pinchbeck: I do not think we need to restrict ourselves or silo too much where heat pumps could go in the economy. There are two things to note in how we get people to take them up. First, as I said, heat is deeply personal for domestic consumers. This is not like decarbonising the power system. It means interacting with people’s homes. They will feel differently about that to maybe other bits of the economy. We need to make it attractive to them, so that is clear, and the messages need to be simple.

The second thing is that the real barrier here is cost. It is that simple. The cost of electricity for consumers is something like four times higher than the cost of gas, for example. If we can be allowed through policy change to create a decent customer proposition, I genuinely think the energy retailers and suppliers will be able to have those conversations with people and other trusted actors and communities and so on. Fundamentally, if you get the customer proposition right, suppliers will sell this, and they will work out the right homes and the right customers to sell this to. It is what they do; it is their specialism. That is what we should say first.

In terms of the customer proposition, there are changes we can make to taxation. There are changes we can make to regulation. That is the stick bit. There are changes we can make in terms of subsidy, if necessary. That said, there are some really obvious bits of the economy to go at first. Public buildings, for example, where there is often a very good business case, where Government and local authorities can push for change. That is a good target.

There are 7 million homes in England and Wales that are rated EPC C and above, so already highly efficient. We could go at those for heat pumps. In terms of commercial buildings, particularly if we tweaked VAT or building rates, we can again encourage heat pumps, and particularly heat pumps on heat networks in urban environments. In off-gas grid homes,



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we can look at doing things with how we calculate EPCs or other regulatory changes to incentivise those consumers over time. There is no reason technically why heat pumps cannot go into many UK buildings. Again, this comes back to allowing the market to work out how to target, deliver and sell heat pumps, just as we have done with electric vehicles and with other electrical products in people's homes.

Q9 Dr Matthew Offord: That anticipated my second question, so I will move on. To incentivise a switch to electric heat pumps, you have suggested that policy costs across gas and electricity should be reviewed. Could you explain how that would make a difference?

Emma Pinchbeck: As I said, at the moment, in terms of how it turns up to the consumer, electricity is about four times more expensive than gas. Just in the context of the energy transition, very broadly, we are going to electrify a lot more of the economy, so it makes sense for electricity, which is very cheap to produce, especially with more and more renewables on the system, to be cheap as it reaches the consumer.

There are lots of different ways that you can do that. The Government have already started, so there is a bit of a precedent for this because they are already reviewing the approach to business rates. They are already looking at whether we should apply a net-zero test to the economy. That may have come out in the CSR today, but I have not seen it. It is a good moment to look at costs for decarbonisation, where they fall across the economy and how they turn up to consumers.

Put simply, if we change that, it means we can build a better consumer offering for heat pumps and allow the market, and particularly suppliers, to help with this huge delivery challenge. That is what we are talking about there.

Dr Porter: That would also fit into the customer engagement piece, if one is looking at the whole-life cost, not just installation costs—Emma's point on changing electricity costs. It is beginning to change. I know there are at least two suppliers that have a very basic heat pump tariff, but this needs to go much, much further. Then, when you work out the whole-life cost of running that system, suddenly the amount of money on your electricity bill goes way down, particularly if you are signing up to renewable power in your tariff.

Emma Pinchbeck: We should be clear for Committee members who might not know this, because we have all danced around it but not said it explicitly. When we are talking about costs, it is largely about capex, where there is a big difference between heat pumps and boilers at the moment. That is largely because of scale. Heat pump installation in the UK is essentially a cottage industry, so they are competing with an established technology.

Once you have the technology, often your running costs are lower for a heat pump. The more efficient the heat pump, the more that is the case.



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What we are trying to get at is a way to make that initial outlay by the consumer much, much more cost-effective over the lifetime, for the operation and the capital cost of installation. One of the reasons that heat pumps are not coming out and being able to compete with gas, despite being cheaper to operate, is essentially to do with Government decisions around policy, taxation and where costs fall in the economy.

Dr Rosenow: On the operating costs, it is the point that Randolph made earlier about flexibility. I also have to declare an interest here. Similar to Philip, I have a heat pump in my house in Oxford, which is not one of those properties that Emma mentioned that is already well insulated. It is a typical Victorian property, 140 years old, and we run our heat pump with a variable tariff that changes every 30 minutes. It is fully automated. Just by doing that, we reduced our heating costs by 80%.

If you think of a package where you can essentially lease a heat pump and get a tariff associated with that, and then somebody manages your heating, as a consumer, you do not need to know anything. You just say, "This is the temperature I want, and you can guarantee me a certain cost for providing that heat." You can suddenly see that the economics stack up much more than when you just look at capex, so it is essential that we talk about flexibility and time-varying tariffs in this context.

Q10 **Dr Matthew Offord:** Are you describing the dynamic tariffs?

Emma Pinchbeck: Yes.

Dr Rosenow: Yes. There could be very simple tariffs, where you have time-of-use tariffs. During the peak hours, you pay more, and it is the flat rate during the other hours, or something much more sophisticated where your tariff changes in real time and is linked to the wholesale market. Both work. I think the jury is still out as to which one works better for heat pumps, but they are both very effective.

Q11 **Dr Matthew Offord:** Obviously, you are extolling the benefits. There must be some negatives to dynamic tariffs. What would they be?

Dr Rosenow: The negatives would be, if you do not manage your heat pump well, you might pay more. Even then, your heat pump has a different profile to a gas boiler, where you cannot just come home, turn it on and then in 20 minutes your house is warm. It runs in a much more continuous fashion, different from a gas boiler. You do not have the same load profile with lots of peaks in it. It is a flatter profile. You do not have a big disadvantage even if you do not manage it. You are losing out on savings, essentially, if you do not do it.

Emma Pinchbeck: There is a question around automation. I talk about my mum in this context. She does not have a heat pump and is not a particularly engaged energy consumer—I suspect Jan might be—and she has recently signed up to a dynamic tariff. I am not joking when I say I get a text from my mum about every 25 minutes, talking about how she is changing her energy use in her house to make savings on her energy



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bill. You might remember Economy 7, because certainly, again, my mum ran our entire house on Economy 7. What we are talking about is that, but much, much smarter. Potentially, for many energy customers, it will be automated so they do not have to worry about it.

The risks around that are, of course, making sure that, first, you trust your energy supplier to do that for you and that there are customer protections built in. Energy UK is doing all the work on that with industry, with Citizens Advice and others. If you think about this in the context of a huge change for the entire energy system, flexibility is going to be key. We have people with electric vehicles. We have people with electric heat pumps. We have onshore wind, offshore wind and solar on the other end of the system. Making that all work together will require more flexibility at every level.

Despite there being some risks to make sure that everyone benefits, there is a massive upside for the networks. Secondly, they will tell you that my entire industry is now organising itself around the principle that there is going to be a lot more electrification, a lot more renewables and clean technology on the grid, and that our offer to customers will be brand-new energy services where we are helping people do more than just stick a plug in the wall and not think about it, taking what they get at whatever time of day. It will be a much more nuanced and cheaper way of running our lives, and it will hopefully be very simple for the consumer at the other end.

Dr Porter: There is continuing work, which I am leading for Government, on trying to get all the standards in place to allow this to work, so there is not one offer from one company and you have to change all your kit when you change supplier. It is going well-ish, going in the right direction to get that to work. I absolutely agree—and probably all four witnesses today are in complete agreement—that this new system is a flexible system, integrating products, not just heat pumps, but EV chargers and maybe even your fridge-freezer, and storage and photovoltaics if you have them. All of this can work.

I have an app on my iPad, and we could not work out how to show it. Basically, dynamically, I could show you how much energy in my house is coming from the roof, how much is in the battery—I do not yet have a heat pump in my house in Watford—how much would go into the EV. That is all possible, and it is happening now. This is why I absolutely agree that we cannot just think about heat pumps on their own. It is part of a bigger change to the system.

Randolph Brazier: Most of the time-of-use tariffs that we have been talking about are reflecting what is happening in the wholesale energy market. From a network perspective, we are looking at how local flexibility markets can play into that as well. This is where people can provide that flexibility to the local distribution networks, and that offsets the cost of building those networks.



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We now have over 2 gigawatts of local flexibility markets running this year alone. As far as we can see, these are the largest local flexibility markets in the world. That is just another revenue stream that a heat pump owner, providing they have some flexibility, can effectively access. It is critical that to have that flexibility, you have to have a house like Emma described, one that is built to a relatively good standard, and/or some form of thermal storage or battery storage alongside the heat pump itself. That is what is so critical.

If you had that flexibility, it can also somewhat reduce the cost of capital from a network perspective. When you connect a heat pump, there is potentially a cost of upgrading your electricity network connection. If you have that flexibility upfront, it can reduce the cost of that connection in certain circumstances as well.

Emma Pinchbeck: Sorry to add to the list of things we want from policymakers in this context. In terms of key kit, this is why you hear the energy industry banging on about the importance of smart metering rollout. What we lack in the system is real data about what is happening at every level, and Randolph will say the same at network level. Being able to see what is happening is really important.

Q12 **Chair:** We are going to come on to that in a minute, if you do not mind.

Emma Pinchbeck: Good. The other thing is pricing and charging. Making sure that we have cost-reflective charging across the network is really key. That, again, speaks to how we build the customer proposition around this.

Chair: Now we are going to Robert Goodwill, who has a similar constituency to mine with a lot of the households off the gas grid.

Q13 **Mr Robert Goodwill:** Yes. I am sitting in a house that was built, when we moved on to this farm, 170 years ago and we are heated by oil and solid fuel.

From what I heard so far, it would seem that the homes that are most easily able to switch to heat pump technology are the more recently built homes with better levels of insulation and are quite likely to be on the gas grid, whereas a lot of properties off the gas grid would be more difficult. What proportion of existing properties are currently able to switch to a heat pump without major work done to the property itself?

Dr Rosenow: The Committee on Climate Change thinks about 10 million are already "heat pump ready", to coin a term. It thinks another 10 million could be upgraded to be reasonably efficient to host a heat pump, which leaves some buildings, especially listed buildings, where you may have difficulties in upgrading them sufficiently, but it is still a sizeable portion of the building stock. Ten million now and another 10 million going forward, depending how fast we are with the energy efficiency upgrades that we are rolling out.



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Maybe one more point on rural properties. Some research has been conducted on the heat loss issues. Rural properties are fairly good at keeping the heat in. The very thick, solid walls are much better than people thought, so they are more efficient than we may have thought in the past. Some of those, even the not so well insulated, may have fairly good thermal storage capabilities that we may not anticipate at this point.

- Q14 Mr Robert Goodwill:** From what I have heard so far, it would seem that there are not just different sorts of homes, but different sorts of families. For example, with our oil boiler here, we can come in at 6 o'clock after a couple of days away, turn on the heating and, bang, within half an hour the house is comfortable or at least tolerable. It seems that with a heat pump, you have to have it on all the time, which would include expensive times of day and evening for electricity. Is that the case?

Dr Rosenow: Not all the time. You can ramp it up or down. You would not switch it off entirely; you would always leave it running at a very low temperature. Let's say you are away for a couple of weeks over the winter and it is very cold. You would not switch it off entirely. You would leave it running at a very low temperature. You would need to tell it, "We are coming back tomorrow. Switch back on," because it will take more than a couple of hours to heat your home. You can do that with your phone. When you leave, you just tell it, "We come back in two weeks' time," and then your home will be nice and warm when you return. It has to be automated or you have to wait a little longer. It is certainly different, in terms of the consumer experience, to an oil boiler or a gas boiler. It is not as responsive.

- Q15 Mr Robert Goodwill:** For a family with young children in the house all the time or a pensioner family, it would work better for them than maybe for people who are there backwards and forwards, at work or whatever?

Dr Porter: The house I am doing is in North Yorkshire. It is at the opposite end to where you live, I think. It is the far west of North Yorkshire.

Mr Robert Goodwill: We are at the best side.

Dr Porter: I would argue about that. We are not going to live there all the time, or certainly not yet. The heat pump we are putting in will come with a smart control system as part of the package. With that smart control package, exactly as Jan was saying, on my phone or on my computer, or whatever technology I wish to use, we will be able to sit in Watford, where I will probably still have to commute to London even when we finish the current pandemic, and control when the heating goes on.

If we set it up with a demand-side management service, we will be able to keep that house to a temperature, say 12 or 13 degrees, to keep the chill off, make sure there are no frozen pipes, and automatically ramp it up over two days for when we or somebody else are using the house.



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That is a very flexible system, whether it is someone at work or at home with the family or, indeed, a second home.

- Q16 **Mr Robert Goodwill:** Emma, how can we encourage or support owners of existing off-gas grid homes or, indeed, on-grid homes to switch to heat pumps? I am thinking particularly of the scenario where your boiler breaks down, the guy comes along, looks at it, shakes his head and says, "You need a new boiler." "When can you get me one?" "Well, I can get it tomorrow. Fit it on Friday." What would be the timescale for a heat pump in that situation? Most people do not plan to replace their boilers. They replace them when they break down.

Emma Pinchbeck: It is a good policy rule when we are thinking about heat and people having the opportunity to replace their heating systems to think about intervention points, so house renovations or moving. It is more complex in the situation you describe, where it is an emergency replacement. That said, it is more complex because of the relative sizes of the market. Part of the reason that there are lots of installers available and you can have a gas boiler cheaply is that it is the incumbent technology, and heat pumps should be there eventually.

How do we make that world happen? There are two things. First, again, if you have the right proposition, if we can get the value of these technologies right, suppliers will go to town working out which consumers can have these technologies and when, and they will be part of that solution.

The second thing is, for more difficult sectors, regulation and support are key. These are areas where you might want to offer additional grants or subsidy, or where you might want to introduce a regulatory nudge over time, in a way that does not disadvantage people.

I will embarrass myself by saying that I renovated the house I am sat in here in London. I made it as energy-efficient as possible, but I had a three-week-old baby when we were coming to decide on the heating system. It was at that point a fairly complex decision about whether to have a heat pump or a gas boiler. I suspect if there had been a regulatory nudge or an easier process, a good consumer offer or, indeed, a grant at that point last year, we might have changed what we did, even with a poorly three-week-old baby. That is what we are talking about over time.

For off-gas grid customers, you could tighten the requirements on the standards of homes, or you could look at the current EPC calculation, where fuel is taken into consideration. Again, it skews the commercial proposition. You absolutely do not want a blanket approach. Just because you are off-gas, it does not mean that you are not a block of flats in Cardiff or a rural property in Gloucestershire, where I am from.

The other thing to note in your example is that you need the installers to be there. I think we will come on to this, but we are looking to train and



skill up installers and to move air-source heat pump installation from being quite a niche, specialist skillset and a small industry to being something that is very normal and where we have installers all over the country.

For us, there is a massive opportunity there. We are talking about tens of thousands of jobs, in exactly the same way as there are tens of thousands of boiler engineers and heating engineers all over the country.

- Q17 Mr Robert Goodwill:** Howard, you have a lot of practical experience. If we were to have this situation in the house this afternoon, if my boiler broke and I wanted to install a system, what is the soonest I could expect to get it in? I guess I could get a boiler here within about five days and have it fitted, but how long would it take me from a standing start to get a system in? In a cold November, even though North Yorkshire is wonderful even at this time of year, would that be an option in a case where the boiler breaks down?

Dr Porter: To be honest, no, if it is a broken boiler and it needs to be replaced—we have all been in that situation—or hopefully fixed. The difference is if the installer comes around and says, “I’ll tell you what, I can definitely replace an element of that boiler and maintain it for the rest of the winter. We can replace a certain element. It will cost you £500, £400, £300, whatever, and it will carry on for another year, but what you really want to do is change your system to a heat pump.” That is ultimately all down to the sales technique.

What does the installer, one of Emma’s members or anybody else say to the consumer? They are the decision-makers. Rather than say, “I would get a new boiler,” to which is probably the normal reaction, “How much will that be? When can it come?” They say, “Look, I can maintain this for the next six, nine, 12 months for a relatively low cost. What you really need to do is this, and I will give you a quote on replacing your boiler, with the grant, with the private finance, with everything else that goes with it,” so you start the process then. It is not quite a simple, black and white, “What do you do in that situation?” It is a different sales technique.

- Q18 Mr Robert Goodwill:** I can understand. What impact would bringing forward the date for introducing the Future Homes Standard have on heating in new builds, and are there necessary supply chains in place for new builds? I know that when people are looking to buy a new house, the price sensitivity is that they know what they can borrow, and they look for a house in that category. Putting on photovoltaics or an expensive heating system could be a real disincentive.

Dr Porter: If we are looking at expanding the market, this is absolutely vital. The quicker this comes, the quicker—not as quick, as people need to have a bit of time to get the systems in place and plan the systems. Pretty much, I think we heard 2023 in the spending review today. I very quickly read it this morning or over lunchtime. That would be a good



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time, because if that was put, "It is going to be in 2023,: all parts of the industry would get their heads around how to do that.

I have been in the building industry many years. My PhD, many, many moons ago, was in all this. Builders can build energy-efficient houses as cheaply as inefficient ones, if they are given enough time and the stick is big enough. If you own your house and they integrate, they will get deals with heat pump manufacturers. They will get deals with underfloor heating manufacturers. It is their commercial operation, not mine. The sooner we can get that in place, the better.

That means the associations will co-operate to get the right offering for those builders to get it in. It means that in some cases those new-build houses might not even need a heat pump, because if they are built in such an energy-efficient manner, the actual space heating load is very little. It is all about hot water. There are other methodologies to do hot water. You might or might not need a heat pump, although I have been told that manufacturers are developing very small-scale heat pumps for just that use.

Dr Rosenow: In quantitative terms, it could have a pretty major impact when you look at the current market size, which is something like 27,000 last year, probably a bit more than 30,000 this year. Something like 250,000 homes have been built in the last year where we have data. Even if only a relatively small portion of those have a heat pump, you suddenly get to at least a doubling or maybe even a quadrupling of the market for heat pumps very, very quickly. I think it would have a significant impact in the next few years.

Going forward, of course, new builds are the smaller bit. The existing stock is where most of the potential lies for heat pumps. To kickstart the market, new builds are essential, and it is the easier bit to do. We can learn a lot from that and then do the more difficult properties a little bit later when we have ramped up the market and installation rate.

Q19 **Mr Robert Goodwill:** In terms of the suppliers, do we know what proportion of gas and electric come into a home from the same supplier? If it is the same supplier, they do not have the incentive to take the gas out and step up the electric. They seem very keen to get you to sign up to both when you have one of them.

Emma Pinchbeck: It is a more complex picture than that. If you have a supplier offering you both gas and electricity, it is not necessarily the case that they cannot see where the future of the industry is going. To that end, the points I am making today are on behalf of the entire energy supplier market. We are convinced that air-source heat pumps are going to be a heat technology for the future. There is no question but that we need to be investing in policies to take this forward. Again, the points about levelling the playing field across the economy in terms of net-zero costs, everything I have said today is with that hat on representing the retailers.



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Again, what will help that is for all the retailers to be able to have a viable customer proposition for heat pumps in the way they do for gas boilers. That is behind all the asks in looking at our policy, in taxation and regulation, to enable energy suppliers to have that conversation with customers.

This is an industry that sees net zero as absolutely critical. It is essential for environmental reasons, but we also see it as an industrial revolution that we want to be part of. This industry will be responsible for delivering most of it. If you think about the Prime Minister's 10-point plan, nine out of 10 of the objectives on that plan will have to be delivered by the energy industry. Apparently, we even do some tree planting, so 10 out of 10. We are asking to be enabled and empowered to do that. We think there is a lot of private capital and a lot of interest in helping the Government deliver on net zero, but there is no question that this is the route forward for us.

Q20 Chair: I want to pick Jan up on a comment you made. I think I heard you say, Jan, that there has been a reconsideration of the heat retention properties of thick walls. Are you feeding that into any review of the Energy Performance Certificate? Is that being fed into anywhere? At the moment, energy performance certification does not recognise what you have just said.

Dr Rosenow: Do not get me started on Energy Performance Certificates. There are a whole lot of things that need to be reformed. You could run an entire inquiry just on EPCs—

Q21 Chair: We are. We are doing one on energy efficiency in existing homes, and I hope you have given us some evidence on that. If you haven't, perhaps you would like to look at that, because that inquiry is not yet concluded. Perhaps we had better not get distracted.

Dr Rosenow: If you were using real data to feed into EPCs and how they are being built, you would pick up those inconsistencies and not penalise buildings that do quite well in reality but not so well on paper, and the same goes for heat pumps. There is a disincentive to install a heat pump right now because the EPC assumes too high a cost and consumption that is unrealistic. My building was EPC E when I had no heat pump. I installed the heat pump and installed efficiency measures. It is still an EPC E. I could not believe it, but my energy costs have come down. I asked the question: why is that? It is all to do with the outdated methodology, but I understand it will be reformed in the coming year.

Chair: This is music to my ears, so hopefully the heat in buildings strategy will address this when the Government get there.

Dr Rosenow: Hopefully.

Q22 Cheryl Mackrory: We will now move on to the non-domestic area. The non-domestic RHI went live in November 2011 and provided tariffs for renewable heat installations made after July 2009. As of August 2020, a



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total of 2,188 groundwater and air-source heat pumps have been accredited to the non-domestic RHI, which, according to the Kensa Group, has been less than 10% of the intended number of installations. The reason I highlight that, for full disclosure, is that the Kensa Group is based just outside Truro, which is in my constituency.

That said, what role can heat pumps play in non-domestic settings, and where are they most appropriate? I know we have touched on this before, but a bit more detail would be great.

Dr Porter: First of all, I think the non-domestic RHI can continue. It has not achieved as much, for some of the same reasons as we have discussed for residential. It is not a technology that building owners understand.

It is worthwhile looking at the different types of non-residential, and this is applicable for many different situations. You have many non-residentials that operate like houses. The flat above a shop, the local pub, the local office with two or three. You have a residential gas boiler in there. You can put a heat pump in, the same as your house. That is a certain part of the market that I do not count as non-residential. They are residential-ish.

If you want to try to put heat pump technology into a big office block, one has to consider that they are very different animals. It probably has air conditioning, which has some of the same technologies as a heat pump. Randolph mentioned that in Australia you have an awful lot of air conditioning, so you have air conditioning in those office blocks. It is a different technical challenge to put heat pump technology in those situations, and they may well have heating through the air conditioning anyway.

The building we used to be in in central London had a very poorly performing combined heating and cooling system. It was somewhere in the cellar. I do not know how it worked. Changing that is a very, very different proposition to doing it in residential. Is there opportunity? Absolutely, yes, but it needs a different but very focused view on how we make those changes, rather than just giving them some money.

Emma Pinchbeck: The first thing is that we need this sector to decarbonise, like everyone else, to enable a net-zero economy. You have to start from that basis. As Howard has said, though, it is a different sector and again multifaceted in the kinds of buildings and applications we have. This comes back to it not having to be heat pumps absolutely everywhere. There are a range of technologies available to us in the long run. We are recommending that we get going on heat pumps wherever we can do them now because of the scale of the problem and because they are, frankly, a core technology. For things like large-scale industrial heat users, it will almost certainly be something like hydrogen. For things like office blocks, you can do heat networks.



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It is important to note that you can have heat pumps on the end of heat networks, but different sizes of heat pumps come into play, or you could still do individual heat pumps. It will depend on the customer and the property. Again, we have to properly segment the market. Energy suppliers will be able to do a bit of that because we do it all the time, but it will be part of the consideration going forward.

For policymakers and your question about non-domestic RHI, it is what we have at the moment. It is not delivering, just like the domestic RHI, at anywhere near the scale of installations we need or hoped for when the policy was designed. There is an argument—and I think Howard made this earlier—that we should continue it over the gap while we do some really serious work on regulatory carrots and sticks to help get this market going.

I talked earlier about looking at business rates or VAT for this sector. That is certainly something we could do. Then we could have a regulatory nudge again, like for off-gas grid, where over time we incentivise people to be looking at decarbonising their buildings. It is just like in the domestic sector. We are nowhere close to the ambition we need.

Randolph Brazier: I agree with a lot of Emma's points. I will not repeat all of them. The one thing I will say is that, with industrial and commercial customers, a lot of these guys already have the flexibility I was talking about earlier. Within our local flexibility markets, the 2 gigawatts I was talking about earlier, most of the participants in that market are these sorts of characters. That is because they have HVAC systems, they have potentially some form of storage, and a lot of their demands are flexible. They can shift their demands to different times during the day. They can change their shift pattern, et cetera.

Pairing the inherent flexibility in that business with a heat pump is a bit of a no brainer. It means they do not necessarily need to install the flexibility upfront, which we are saying from a networks perspective you have to do from a housing perspective. There is a real advantage there.

Q23 **Cherilyn Mackrory:** That is useful. Thank you.

The Committee on Climate Change suggests that plans are needed to support larger heat pumps in non-residential applications. Should the Government, therefore, extend the non-domestic Renewable Heat Incentive?

Emma Pinchbeck: It is what we have for now. If you are taking away any message from this evidence session, it is that we need to crack on with what we have. Yes, in the absence of anything else, extend it, but we need to get working on looking at the regulatory and policy interventions we can make to get the market going. Do not rule out anything with heat pumps. That is not to say we will not have a mix and that we should not do the easy things first, but we are expecting them to go in lots of different applications, in lots of different kinds of buildings



and for lots of different kinds of consumers. There is no reason why we should not be looking at larger heat pumps as part of that consideration, too.

Q24 Cherilyn Mackrory: What further support should the Government be doing in this sector for the uptake of heat pumps? We have talked about the different scales in the market but, to cover all that, it sounds like the Government will have to be incredibly flexible on what they offer. How would you set that out?

Emma Pinchbeck: Start from the top. It is this point about making sure that costs fall evenly across the economy. Start from the top, look at the whole economy and where the costs of decarbonisation fall, review them and make sure the costs of relative technologies stack up and that gas and electrification have a level playing field, for want of a better term, going forward.

Then you can look at regulatory incentives. We have talked about EPCs. We have talked about changing VAT or business rates. All of that helps form a customer proposition that, hopefully, enables suppliers and others to sell these technologies and work out how to market them effectively.

The other thing you could do is consider further upfront grants. We have all discussed that capex is the biggest problem. The operational savings from doing this are considerable. It is about getting the technologies to scale and getting costs down. Grants are an option, particularly for larger heat pumps.

We have all mentioned flexibility in markets and dynamic tariffs. The Government need to look at that, too. This is about considering the whole energy system and how to encourage flexibility right from the wind farm to the plug.

Lastly—and I meant to mention it in my previous answer—this is a big industrial challenge but a huge opportunity to create skilled jobs all over the country. We would like to see the Government invest in training and skills. They have started some of that work, but looking at it specifically for heating engineers and installers would be a good move.

Q25 Cherilyn Mackrory: Yes, that would be useful in my patch in Cornwall. It is a big issue down that way.

Jan, could I take you back to when we were talking about dynamic tariffs? I used to work on a dealing floor in the City for the gas and electric markets, so I know a little bit about this. I like the idea of tethering bills to the market, because you look like you are going to get the better price.

However, I wanted to caveat this and get your opinion on it. When I was working there, it was obvious that there were lots of other players in that market who certainly did not have the best interests of the energy companies at heart and certainly would not have had the best interests of



energy consumers at heart. They were in it purely for profit. I will not name names, but we can all probably guess which sectors they were in. That sometimes drove a good price and drove the markets down, but often it would drive the markets up as well.

That said, do you think consumers will definitely get a good price when it is purely tethered to the market?

Dr Rosenow: If the market is functioning and if it is reflecting true costs, then, yes, of course. Randolph referred to the costs of managing the grid, for example. If those costs are being passed on and are both time-dynamic and locational and not a flat rate across the customer base for the entire country, and if energy markets reflect the cost of production of electricity, then yes. You are right, if the market is in itself not functioning well, the pricing based on market prices will also not be functioning well.

When you look at existing pricing regimes in the UK, they work pretty well. I will not name particular suppliers in this session, but there is good evidence that suggests switching to a dynamic tariff shifts your consumption behaviour significantly. We know this especially for people who own electric vehicles, and there is also emerging evidence for people who own heat pumps.

The tariffs are working and are affecting customer behaviour, but you are right that we need to make sure the markets are reflecting the costs and the benefits. That is so important. Sometimes people say that if you switch to a flexible tariff, everybody else has to pay for that, but it is the opposite. If you switch to a flexible tariff, you are providing a system service because you shift your consumption from hours when it is expensive to generate and distribute that electricity to hours when it is much needed. You are absorbing excess electricity in the best case, and you are helping not to congest the grid. In an ideal world, you can make this work well for customers and also for the grid operators and the generators.

Q26 Cheryl Mackrory: That is useful. There was a lot of holding on to units of energy and then suddenly having to sell them at the end because they could not provide them to customers, but I get what you are saying.

Emma Pinchbeck: It is worth putting this in the context of the energy transition that we are now rapidly embarking on. If you have worked in energy trading, you will know that every value in the system is shifting because we are putting different technologies into the system. While I am not declaring a revolution, I am saying that if you put in more flexible assets that are producing clean electrons, a wholesale price that is driven by a fossil fuel and a market design that has grown up around a centralised system will inevitably have to shift over time.

With dynamic tariffs, we are talking about rewarding customers right now—we are doing it right now—to shift their behaviour to their own benefit and to the benefit of the grid. I talked about my mum earlier. This



is not just people with EVs and heat pumps; this is my mum in Lincolnshire and how she uses her washing machine.

Going forward, dynamic pricing, flexibility and the ability to be much more transparent from top to bottom in the system and to sell different services to our customers is where the energy industry is orientating itself. The markets that you talk about are fundamentally changing, too, and these technologies are driving that, but in the long run that is going to create a brilliant conversation between suppliers and customers on the other end of the system.

Q27 Alex Sobel: We have already discussed the fact that we are going to be decarbonising heat, transport and other areas of the economy, and smart systems are going to put a huge load on the infrastructure and network capacity. What is the estimated cost of upgrading the electricity grid and the distribution system to meet future peak electricity demands?

Randolph Brazier: That is a good question. We do not upgrade the grids for one technology. We have a range of different technologies that we look at when upgrading the grids. Heat pumps are one of them, but we look at other technologies like renewables, electric vehicles, storage and so on. We also look at general demand growth, population growth and asset replacement. This is replacing old assets because the average age of the grid in the UK is pretty old at over 50 years.

What does that mean in terms of costs? We are looking at this at the moment because, with our regulator, our next regulatory period starts in 2023 for the distribution networks, so they will be submitting their business plans at the end of next year for that. We are bringing in all these factors at the moment to try to determine exactly what those costs are. Each of the networks are doing that.

Then, from a national perspective, from an ENA perspective, we have also developed what we term a low-carbon technology tool. We are looking at the impacts of electric vehicles, heat pumps and other low-carbon technologies on the networks from a macro perspective and trying to understand the costs. There is a range of different scenarios you can look at, as you can imagine, and we are updating that soon to incorporate the latest forecasts and targets set in the 10-point plan.

One of the initial findings we are seeing is that if you include, for example, 40% of your electric vehicles and heat pumps with flexibility, you can reduce costs by over a third. That is without even looking at the new scenarios and the new levels of heat pumps.

However, the challenge—and I guess the ask from the Government and our regulator Ofgem—is that we need to have the right regulatory mechanisms in RIIO-2 to allow us to invest. That is not only the quantum or the value that we are looking for but also the mechanisms. When there is uncertainty, they need to be much more agile than they have been historically. That is why we fully support the letter that Darren Jones from



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the BEIS Committee wrote last week asking Ofgem to consider more agile processes and to think about future customers, not just today's customers.

Q28 Alex Sobel: I will not pretend to have understood quite all of that, but I am sure we will be able to incorporate it in the inquiry report. That leads me to think, from what I did understand, that there are some significant impacts to fully electrifying. Are there any ways that impact can be minimised? What would peak management entail if we went to a fully electric heat pump and EV world?

Randolph Brazier: You are right that the system is not designed for these technologies. It is not how it has been historically designed, so there is potentially a lot of investment, but you can reduce those costs.

The key thing—and I have probably mentioned it ad nauseam already—is flexibility and ensuring that the peak can be shifted, reduced or moved somehow. It should also be noted that those peaks are national peaks from an energy perspective and from a National Grid perspective. There are also local peaks. Reduce and avoid peaks happening on streets and minimise the impact of that. The key to doing that is flexibility, flexible assets within homes and businesses and the associated markets. That is ultimately the key. Our studies have shown that, even if you include 40% flexibility within heat pumps and EVs, the costs can be reduced by over a third. That is the key focus for us in reducing those costs.

Emma Pinchbeck: Everyone likes talking about flexibility. I will start with two principles to make it simple. One is that we are expecting the networks to have to fully decarbonise, so this is not a case of continuing as we are or doing heat pumps. We have to decarbonise the grid. In that context, the Committee on Climate Change is recommending 750,000-plus installations of heat pumps a year because that is the most cost-effective route to delivering net zero. That includes managing the system integration challenge, which is what we call it in the industry, how you fit all these new technologies together, how you change from gas to electricity and the impacts on peak, and so forth.

However, there is a heavy contingency on maximising the flexibility of these technologies. It is fundamental to them as an asset because they are electric technologies. As long as they are in an energy-efficient building, we can shift when we are using them and, hopefully, therefore, move the peaks either locally or nationally.

Important to being able to do that are three things. One is you need the kit. We need a better understanding of where there are constraints on the network by having better data about the network. The second is smart meters in homes, because that gives us some of the data and also enables real-time shifting. The third is storage and other ways of managing flexibility on the grid. That is the infrastructure bit of flexibility.



Relatedly, we also need the markets. I am sorry to bang on again about the customer proposition but we are talking about making it interesting, attractive and valuable to both consumers and the industry to go for the flexible option so that moving your energy demand around as a customer is an attractive proposition. That can be automated for you in a deal with your supplier or you could do it manually. That does not matter. What is important is that consumers need to have control over their homes and their cars. We are pretty confident you can get significant flexibility.

As we talked about with dynamic tariffs, which fluctuate as prices change and the market changes, we are already doing it. We are already offering dynamic and flexible services. It is about getting them to scale and making them as attractive as possible.

Dr Rosenow: I will make some similar points, and I also want to expand a bit on what Emma and Randolph have said. Your starting point is that net zero means that electrification will happen whether we like it or not, and there is an investment cost to that. The amount of investment needed depends on two other questions. One is flexibility, which Emma and Randolph both mentioned.

The other one is efficiency. We do not talk about that enough. When you look back at what electricity consumption was in the UK 15 years ago, it was 15% higher. A lot of people, when you ask them whether consumption was higher or lower 15 years ago, think it was lower and that we are consuming more electricity today. That is not the case. The main reason for that is an increase in end-use efficiency. If we continue to use technology more efficiently, that also reduces the amount of investment that is needed to upgrade the grid, to invest in electrified heating solutions and so on.

Efficiency also enables flexibility, so that is a critical part of it. Thermal storage in buildings is a critical component in making sure we have sufficient flexibility in the system. Not enough debate has happened around that, but these two elements go together. You cannot have lots of flexibility in the building sector without efficiency.

Your question about putting a figure on this is difficult because we simply do not know exactly how customers will react. We do not have experience. We have never done this before. We can model this and make different assumptions. Indeed, there was research from Imperial College two years ago, which the CCC is using, and UCL is currently producing some numbers that we will see next year. Of course, all this goes hand-in-hand with lots of assumptions that can be made in either direction.

I tend to be more optimistic. If we consider these things from the start, we can minimise costs and maximise benefits to consumers. We have to talk about it in a holistic way and not simply deploy millions of heat pumps and EVs without thinking about their integration into the energy system.



Q29 Alex Sobel: Talking about agile consumers, I have recently changed my home supplier in Leeds, my constituency, and I chose a tariff that included a smart thermostat and smart monitor. What role will smart control systems play in managing electricity demand? You talked about your mother being a smart consumer of energy, Emma. Maybe you want to take this one.

Emma Pinchbeck: I am sure Jan can tell you a bit about how his heat pump works as well but, effectively, smart controls enable us to use heat pumps in a smart way. We can do that in an automated fashion or we can do it with the consumer being more involved in decisions, as you probably know with a smart thermostat and a smart meter.

The key thing is that this works best in energy-efficient properties. If you are moving when you turn your heat pump on and off, you want the building to retain heat as you shift the load. We have already said that we think there are at least 10 million homes that are heat pump-ready in that regard, but with that small caveat. Also, we would love to see more integration of energy efficiency and heat pricing.

The second thing to note is Jan's point about energy efficiency making the flexibility issue easier. Some of that has come from good standards and smarter products. Howard referenced the work going on with BEIS and the BSI looking at standards for electrical products, including heat pumps and also smart products so that they work as efficiently and as smartly as possible when we put them in the system. That should reduce costs for consumers and help to balance the network.

Again, to reiterate the point, we are already doing this as an industry. We already offer an energy management solution, particularly for large commercial users. We need to put some real thought—again, suppliers can be useful—into how we get more consumers to take up these technologies and want them in their homes. That comes back to making this about the service and the value you get from the technology.

My mum is not interested in a smart meter. She is interested in the fact she can run her washing machine when it is cheaper. It is the service that is important rather than the technology. Having a good consumer proposition for all this will enable us to sell the technology to customers. It is in our interests to do it because it is key to managing the change that is coming and to run the grid.

Dr Rosenow: I have a good tariff and full automation. It is critical, to answer your question directly, Alex. How important are smart controls and smart thermostats? They are absolutely essential because you will not get any of the flexibility that we need without having smart controls. You cannot rely on customers switching their equipment on and off. That is too big an ask. It is not rocket science. This technology already exists and it is easy to deploy.



It would be absolutely essential to make sure that, whatever equipment we roll out, has smartness built into it and that we don't build dumb heat pumps that cannot be managed. It is difficult to go back and retrofit. We have to make sure that the products that go in are already smart-ready at least so that you can call on them when you need. It is absolutely critical. Without that, it is not going to work in the way we discussed.

Q30 Duncan Baker: The technology that is coming along is quite exciting. Turning to hybrid heat pumps, one of the challenges we have already seen is that there is not enough take-up of heat pumps in the first place, but it is a technology that is growing quite quickly and rapidly. Of course, if we go back to the first set of comments, it is probably not that they are not popular. They are unknown. As that grows into the market, the take-up will become faster.

Perhaps one way of making that preference shift at a faster rate is through the take-up of hybrid systems, which are probably even more unknown than pure heat-pump systems.

First, where do you consider that hybrid heat pump systems would be most applicable? Would they play quite a good role in helping to mitigate electricity demand at the moment?

Randolph Brazier: We agree with you that they could play a role but they are pretty unknown, as you say. Some of you may have heard of our Freedom Project, a collaboration between two of our gas-and-electricity networks, Wales & West and Western Power Distribution in south Wales. That project showed that they are potentially useful in certain circumstances. They can be cost-effective and can, crucially, lower disruption.

If the gas also becomes green in the future, whether it is a combination of methane and biomethane or even completely green hydrogen, for example, the carbon impacts of hybrid heat pumps can also be significantly lower.

In terms of where and when they are best used, that is still a bit up in the air, but probably some of the houses that are harder to retrofit could make sense, particularly those where there could be a lot of disruption in sealing the home and making it more energy efficient. In areas where the network is heavily constrained and it could be expensive to upgrade the electricity network, they could make sense as well.

The other thing that is pretty important with hybrids is a little technical. They reduce the need for the heat pump to go into resistive heating mode, which can put a big burden on the electricity network. In certain situations, particularly where you have a leaky house and it is cold, it can significantly reduce the electrical burden of the heat pump. In situations like that it would probably make sense, but it is fair to say that they are still unknown and a bit more research needs to be done into where they best fit.



Q31 Duncan Baker: Could I ask that question to Emma as well? What is the trajectory like with hybrids? Are we looking at a window of a few years or five years for this technology to improve?

Emma Pinchbeck: The straightforward answer to the first bit is that they are in the Committee on Climate Change pathways. We need more than one tool to completely decarbonise heating in the UK. Even if we are talking about heat pumps being a significant technology in that, there will be some applications where we might do something different.

There are some examples where you could use a hybrid such as rural off-gas grid, heat networks where the impact of switching from gas to electricity is higher or at a bigger scale. Again, there might be network implications and perhaps consumers who are less willing to make the leap, particularly if they have a big energy demand. You could look at what has happened with hybrid cars and EVs.

In the long run, the gas grid should be decarbonised as well as what is going on with heat pumps. A combined solution should be fully low carbon in future. That said, it is difficult to say how quick or how significant a role that could play because there is not a market, so it is a bit chicken-and-egg. You need to create the right investment framework, which speaks to everything else we have talked about. If you get the market for the air-source heat pump right, you will probably find combined applications coming forward.

There is a question about whether they get supported in Government policy, which I am sure we will come on to, but in general there could be a role for them.

Duncan Baker: My constituency is North Norfolk, and that is fairly rural and fairly off the gas grid. Perhaps I could get the Environmental Audit Select Committee to sponsor having one put into my house and we can see how the technology improves in the next few years.

Emma Pinchbeck: I should also declare an interest. Ten years ago, I was working on heat pumps and heat decarbonisation and we were having many of the same discussions then. Something that has shifted is more awareness of the more complex bits to treat in the market and, therefore, more agnosticism and more positivity around alternative technologies and things like hybrids than there was 10 years ago. Because 100% decarbonisation or net-zero decarbonisation is a slightly different roadmap to 85% emissions reduction, which is what we were targeting by 2050 previously. That is one of the reasons that the Committee on Climate Change has hybrids in its most cost-effective route forward.

Dr Porter: In terms of the technologies, all of it can be done. There are pros and cons of going hybrid or full heat pump. It does depend on the situation, the house type, how big it is and what the heat loss is, but it should be part of the options that a householder has. Again, like the



explanation of how a heat pump works, it is a more complex system, but you absolutely need to have the smart systems in place because you cannot rely on any consumer, including an informed consumer, to make a manual decision whether to use a gas boiler, an oil boiler or a heat pump. It has to be an automated system, so there may be some further barriers in terms of customer acceptance when you have a doubled level of complexity.

If you go for a heat pump, you have one set of technology to get in your head than if you are combining the two. It should be part of the options going forward, but there should be a full recognition that it is not the best solution for all but is a solution for some.

Emma Pinchbeck: I agree completely with that point about making sure it is a smart system. That will speak to any risks involved for decarbonisation and how we maximise use of the heat pump, too. Making sure that as much as possible is easy for the customer would be key wherever these sorts of systems are installed. We are talking about specific applications. Every tool in the box for decarbonisation is a general rule for life.

Q32 **Duncan Baker:** If we talk about every tool in the box, we therefore want to have options. It strikes me that, despite the Committee on Climate Change recommending that hybrid heat pumps should be a considered technology, they are not in the Clean Heat Grant scheme. How much of that becomes a barrier? As with anything in life, if we create a barrier, it will not help us get to our end destination.

Dr Rosenow: You may hear some background noise. I am getting insulation installed in my house. I apologise for that.

Duncan Baker: Using the grant system, I hope.

Dr Rosenow: No, it is not. We would need another session to talk about the Green Homes Grant.

I want to comment briefly on the hybrid question and whether it should be supported under the Clean Heat Grant. Looking at the total size of the Clean Heat Grant, it is something like 12,500 heat pumps per year that it will support. It is very small indeed, and it is not sufficient to drive even fairly modest increases in market size.

Are hybrid heat pumps the first priority? I would not think they are because there is so much potential for non-hybrid systems.

Should they play a role? Potentially, yes. We still need to learn a bit more about how non-hybrid heat pumps perform, their impacts on the grid and how customers interact with them, but we should not rule out hybrid heat pumps by any means. There may be applications where they make sense, especially in areas where there is a lot of congestion and maybe it is cheaper not to upgrade the grid but to have hybrid heat pumps. If you



can use them with a completely green fuel that is not carbon-intensive, by all means we should do that.

We need to be a bit careful about going full pace ahead with hybrid heat pumps because we have two different infrastructures. It could potentially be more expensive and could potentially lock people into a more expensive technology. I caution against going at the same pace for hybrids as we go for non-hybrid heat pumps for that reason, but we should certainly continue with some of these projects like the Freedom Project to understand much better how they can deliver benefits to customers and to the energy system.

Should there be explicit support for them? Maybe some modest support, but I would not make it the first priority.

Q33 Duncan Baker: Modest support, then. Randolph, do you share a similar opinion?

Randolph Brazier: Maybe not quite the same. Basically, when it comes to these sorts of grants and subsidies, we advocate for a technology-agnostic approach, but you have to have a level playing field. We believe it should be technology-agnostic because we are going to have to use a range of different technologies for different scenarios.

Q34 Duncan Baker: I agree. We need to have a range and sometimes, at worst, the concentration will be on pure heat pump solutions. We will find sometimes that a hybrid situation might fit a particular area of the country that can start making a step change but not a full change. Finally, where are the particular risks of relying on a hybrid system?

Emma Pinchbeck: The first and the most obvious concern will be around making sure that any gas part of a hybrid system is low carbon. Fundamentally, we are talking about a net-zero economy and that means that we have to do the things that we can do to reduce our emissions. Heat is an area of the economy where, even if it is difficult, we have solutions that are available that could deliver those emissions reductions. That is unlike something much more difficult, like aviation or shipping. We need to do as much decarbonisation as possible in heat. It would be important with hybrid systems that the gas bit is low carbon. That is the first risk. I am sure Randolph can talk to the ENA's plans for decarbonising the gas grid, but that would be part of the consideration.

There would also be something about complexity. It is a bundled energy service. It is gas and electricity. There was a question earlier about how energy suppliers do that with two different bits of infrastructure in terms of how we think about the grid. To get the real benefits of the system, we need to be mostly running the heat pump, I would imagine, when it is effective to do so, and that suggests some kind of smart system and controls involved.

To reiterate what everyone else is saying, it is every tool in the box for this, but we can see core technologies in the most of the pathways—



which in this case is individual heat pumps on heat networks—and then other technologies filling the gaps where it is trickier. That is what we have to think about when we think about hybrid systems.

Dr Porter: I have a point in terms of the market and how it is likely to go forward. To give you a brief background on the heat pump market, the companies have either come from air conditioning, electric heating or boilers. That is where the companies that are going to be delivering heat pumps into the UK come from.

The companies that come from the electric world are not at all interested in hybrid systems because they believe they can deliver all this with their type of equipment, which can do it. If you talk to the companies coming from the existing gas heating market, they are rather more enthusiastic about mixing it.

Who has the right model? From my side, I have some members saying it is great and some members saying not to bother. That is good. It is somewhere in the middle. Yes, there are some useful situations, but the risks are as follows. If you want a boiler replacement and you decide to keep the boiler in and put in a heat pump as well, how long is that likely to be a system? The next time the boiler goes out, will you keep on replacing the boiler? There are some practical issues for consumers to consider before they go on to the complexity of the equipment.

There is split opinion as to whether hybrids have a real role or not, both on the manufacturing side and also on the delivery side.

Q35 **Jerome Mayhew:** I would like to jump in on the previous conversation. While I recognise that there are significant risks, particularly associated with consumer behaviour around hybrids, a real risk from my perspective—representing as I do a rural Norfolk constituency, right next door to Duncan's, actually—is that without those kinds of options now, we are leaving behind large sections of the country. I count myself among them. We live in old houses. Like a lot of our housing stock, they are Tudor and later, without cavity walls and hard to insulate. Many of them are listed, which brings its own challenges. All of them are off-grid and so overwhelmingly oil.

If you do not allow hybrid, you are essentially saying to people like me, and to many of my constituents, that we do not have an option for the next 10 years until the technology has caught up. My boiler is going to go wrong in the next year or two, but I do not have a solution. If we cannot provide one, we are doing an enormous disservice. Emma, you are, as ever, the first one with your hand up.

Emma Pinchbeck: It is a bad habit, but it is because I was having exactly this debate with a member recently. There are two things.

First, we need to look at the regulatory incentives. Off-gas grid properties and rural properties may require a different set of support mechanisms than customers who should be able to take on heat pumps more



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straightforwardly. That includes looking at how we do energy efficiency and also the exact system they end up having. No one is questioning that but, again, when you look at the whole system and decarbonisation, these sorts of calculations have been done. Overall, for consumers, it is better to be going for 700,000 heat pumps a year, and then other technologies, than it is to do anything else. All of this costing has been done.

That brings me to talking about eventually decarbonising the whole economy. Eventually, we have to do all houses, including rural properties in Norfolk.

A good analogy is to think about other technology development. You probably have a phone in your pocket. It is probably a smartphone. I was at university when the first smartphones came out, but there was no way that I could have afforded one. They were thousands of pounds' worth of new technology. The people who got them were interested in the technology or were in the first wave of buying them. As they have come to scale, cheaper versions have become available. Different versions that are more suited to individual consumers have become available. Overall, the cost of smartphones collectively has dropped. I would argue that it is okay to wait for 10 years in the context of an economic transition that is going to take us 30 years to do.

Secondly, by going for easier consumers first, we learn lessons that we can then apply to more difficult consumers. Thirdly, your customers if they are in the second wave may well benefit from cheaper technology. Lastly, we should of course think about targeted incentives for more difficult customers, customers who need additional support, buildings and constituencies that need additional support. That is the challenge for the Government when they think about policy and regulatory design. Do not underestimate the ability of industry to help solve this problem for you. It is good at thinking through the customer proposition.

Q36 Jerome Mayhew: That is a brilliant segue into markets and how brilliant free markets are at solving problems.

I want to talk about jobs and skills but, before I start getting into the nitty-gritty of what policy measures should be applied, what is wrong with the market? Is the market failing in delivering on the demand, and on the supply for the demand? If it is, why is it failing? It does not normally.

Emma Pinchbeck: It is failing in the sense that I have been working on heat decarbonisation for 10 years and we are still having the same conversations about deploying heat pumps that we were having 10 years ago. That is to do with it being a new technology, at least in the UK. It is not at scale yet and, therefore, is higher in capital costs, has constraints around installation because it is a smaller supply chain and all of that stuff about efficiency of installation affecting the proposition.



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The idea of the Renewable Heat Incentive was to correct that by offering grants and subsidies for the upfront costs. That is certainly an option available to policymakers. More broadly, when you look at the big economic shift that is happening and the energy transition, we are talking about a move more towards electrons and away from molecules.

I am not saying there will not be a role for things like hydrogen, because there clearly will be, but we have a lot of clean electricity generation at one end of the system and we are putting in things like electric transport and electric heating into people's homes. When it is that big a shift, you have to look at where costs fall across the entire economy. Essentially, there is not currently a level playing field in terms of how we allocate costs on electricity and on gas in terms of policy costs. We could start there.

If we started there, we might well be able to do a lot more than with a customer proposition that does not necessarily involve things like grants or subsidies in the long run.

Q37 Jerome Mayhew: Okay, so I am giving up on the market, in the short term anyway?

Emma Pinchbeck: The good news for the Government is that if you correct that, which is actually a shift in where you are allocating costs, you could put it in taxation. There are lots of things you could do. I am not recommending a solution; I am identifying the problem. But the result would be my members being able to come forward to offer the customer attractive propositions in the private sector that would get some of this done.

If you think about decarbonisation, it is fundamentally a capex problem. We need to move a lot of capital, public and private, and invest in an economic shift. The more of that you can take off the Government's balance sheet at this time, while thinking that fiscal stimulus is a good idea, and the more of that the private sector can do for you, the better. We are offering to be able to do that for the Government if we can sort out the regulatory regime.

Dr Rosenow: Briefly, on that point on markets, I want to come back to something that one of the other witnesses said before about the parallels with the car market. You clearly do not have an expectation that the Government is going to pay everybody to switch to an electric car. There is an initial £3,000 incentive to switch, but I do not expect that the Government would pay everybody to switch.

There is a long-term expectation that in 2030, in the new plan, you will no longer be able to buy a petrol or diesel car and the market will find a way to deliver what is required to replace that. We will need to have a discussion, not in the next two or three years but maybe in 10 or 15 years, about phasing out some of the fossil-fuel heating systems and give the market that clarity. A demand-led scheme is simply not going to



deliver the scale. If we continue to rely on subsidy, it is not going to work. We need to give the market that clarity, and then there will be market actors who will deliver the solutions we need.

Q38 Jerome Mayhew: Why wait to talk about this in 10 or 15 years?

Dr Porter: I do not think so. Maybe go back to what I said at the start. There is a role for Government subsidy to kick the market in the right direction and to make the shift. If there are the long-term plans—and I would agree with Jerome on thinking about this a little earlier than Jan is suggesting—and if those targets are there, the accountants and bosses of the businesses I represent, wherever they happen to be in the world, are only going to make the investment decisions when they have certainty. They are going to make decisions in Japan, in the US, in Germany or in the UK, depending where those head offices are, but they need the Government to set the different direction. That probably requires some non-market-based solutions to shift that direction.

Q39 Jerome Mayhew: Dr Porter, if you focus on demand stimulation, like the Green Deal, it is by definition short term, unsecure and not a significant market signal. Therefore, you will have the supply-side problems that we have now. We have a market that has not invested. Surely we should be talking about market signals that are predictable and have sufficient lead-in time and we all get behind it. I see a lot of nodding.

Dr Porter: Absolutely.

Dr Rosenow: If I may, I want to correct my statement. I did not say that we should not have the discussion now. We should have the discussion now, but you have to signal this quite a few years in advance, similar to what we are doing with cars. We cannot require everyone to switch in two or three years' time. That is not going to give the market enough time to ramp up and people to get ready. We need to have long-term signals, but the discussion needs to take place now.

Q40 Jerome Mayhew: We have been discussing a core point over the last couple of minutes. Unfortunately, I am pushed for time.

Dr Porter, how do we ensure robust consumer protection for the installation and operation of heat pumps? What is so special about heat pumps anyway? Why can it not be like a normal contract?

Dr Porter: First, I led Each Home Counts for the Government a few years ago, and that was a review of the competency of installers in the whole energy efficiency piece. I had my battles, I can assure you, trying to get that through.

Now that is in TrustMark, an independent organisation linked to various bits of BEIS. I was on the board. I am no longer on the board. I advise the board on how to take that forward. Under the Green Homes Grant scheme, every installer has to be part of TrustMark. An installer cannot get the grant if they are not involved in that.



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The whole point of that review, which kicked off about five years ago, was to make sure that once we had this transition and once the installers were in those schemes—and in some cases you have to push them to come into those schemes—and we get bad workmanship, they get kicked out of the scheme. They have all the encouragement and the tools to do the right thing going forward.

Further to this, we are still trying to get through the private finance that Emma and I have mentioned before. The Green Finance Institute—and I have been on its expert panel for some time—will lend money only into secure markets. They looked into the residential energy efficiency market a few years ago and said, “We are not lending into that market. There is not enough certainty. There is not enough reliability on installation. We are not going to lend.” Now they are working with TrustMark to make sure that private finance is available only to recognised good installers. That means you are almost guaranteeing that the good consumer offer goes through the correct channel.

Q41 Jerome Mayhew: We have the microgeneration certification scheme as a sort of quality mark, but by current calculations only about 2,000 people can certify that in the entire country. While these quality standards are useful and you can see the reason for them, they are also a brake on the expansion of the industry at a time when we want to expand. How do you get around that dichotomy?

Chair: It was fewer than that. It was 1,200 TrustMark, and three of the Federation of Master Builders’ 7,000 members are certified.

Dr Porter: We have discussed this many times. The problem goes all the way back to the start of this conversation. The market for heat pumps is small. Therefore, the number of installers is small. If you expand the market, those installers will get involved in the MCS.

I would challenge you a little bit in terms of leaving it up to the market. The problem energy efficiency has had—look at double glazing, look at solar—is that it does not have the best reputation in terms of competency and good value for consumers. The whole point of MCS and TrustMark is that it may cost a little bit but it will ensure that customers get a good product of good value. Hopefully, we will try to make that system more efficient to make it better and, therefore, less costly to give that assurance.

Emma Pinchbeck: Hopefully, I will let you segue back to your previous interest in markets, Jerome. I agree that, if there was a market, we would have more MCS-qualified installers. It is that simple. No one is going to invest in training for something they cannot see a market for.

On the supply chain for this more broadly, you get the supply chain mobilising and you get jobs and skills training being invested in when there is a clear, long-term pathway for industry. We have learned that



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lesson in large-scale renewables with offshore wind, onshore wind and solar. You see the rollout so that people invest.

It is the same with this sector. The Prime Minister's 600,000 heat pumps target is a little bit short of the CCC's 750,000, but nevertheless it is a volume that the industry can work towards. Let us legislate for that and get on with the job. That also speaks to why we have talked about the Future Homes Standard coming forward in 2023 and that being important because, again, it sets a trajectory for industry to mobilise behind.

We could do some specific work on skills. The Government have an interest in this area. There is the national skills strategy. Why not make sure that decarbonisation of heat is captured within that? I would also suggest that it could be an area of work for the green jobs taskforce that has been set up. Let us look at jobs specifically.

Lastly, on consumer protection, as an industry we think it is important for consumers to be protected and to feel they can trust these new technologies as they come forward. It goes further than certification, though. We would like to make sure there are clear points of contact for more consumers to think about the decarbonisation solutions available to them and the trusted sources they can ask. At Energy UK, we are working as much as we can with Citizens Advice and others to do that.

Q42 Jerome Mayhew: On that one point, to get that trusted information, it has to be bespoke. Someone has to come to your house, essentially, unless you have a standard unit that you live in. The economics of that are that you have to be quite well trained and quite well qualified to give good expert advice, and yet you are dealing with a single residential unit for which the price point must be pretty low.

This morning I was talking to Mitie, a building facilities management company with 47,500 employees. It has divested itself from the residential side of the market. It can get the scale in large commercial buildings where the tech pays for some of the more expensive aspects but cannot get it in residential. How do we fix that?

Dr Porter: I have tried to get somebody from Watford Council where I live. I tried to initiate something after they announced the zero-carbon plan for Watford, which I thought was a little bit ambitious given the timing. I tried to have contact with them. My personal view is that the local authorities in your constituencies have a big role to play in providing independent advice on housing to people who are largely non-technical and need advice.

The problem we have in Watford is that there is one energy efficiency officer. To be frank, he said he is a busy person and I imagine he is a very busy person. The problem is how to increase, probably, the number of energy efficiency staff within local authorities so that we can train them in heat pumps, smart systems, insulation or whatever we need. That is definitely the best way because the local authorities largely—and



there are good and bad ones—know their consumers better than we do and can achieve that better.

Jerome Mayhew: I am going to stop there, but what about the system of EPC measurement and making that more efficient and perhaps building advice on the back of people who have gone to your building anyway to look at your energy efficiency? On that bombshell, I am going to hand back to the Chair.

- Q43 **John McNally:** E.ON said that one of the biggest barriers to the mass deployment of heat pumps is public awareness and acceptance. Heat pumps are not a technology with which most people are familiar. The National Grid also stated that a key challenge is the need to create a situation in which heat pumps and other electricity-based heating solutions can become the favoured choice for consumers. You mentioned Citizens Advice there. They made some comments to us. I do not have enough time to bring them in. Emma, what steps need to be taken to engage the public with the transition to low-carbon heat?

Emma Pinchbeck: To start with, if you talk to the public about the principles of decarbonising their heating, over 90% say they think heating should be greener. Most of them do not necessarily know that their boiler is a source of emissions, and then they immediately want to do something about it when they find out that it is.

We saw some of that at the climate assembly where they presented the evidence for decarbonisation, and the public recommended stronger measures than we could have anticipated in terms of technology change, including in their own households. There is not an issue of reluctance to change. It is simply one of engagement.

- Q44 **John McNally:** Not everybody is fortunate enough to have you as a daughter who can advise them. That seems to be nub of the problem.

Emma Pinchbeck: Yes, although I try with my mother and that is sometimes more complicated than convincing other people. The conversation needs to happen at every level. The Government can help that by setting clear targets. We have seen that with the EV phase-out date. The public has become aware of that. It will inform their choices. It has started the discussion.

If you think about EVs, though, it is important that when they see the target and they understand the change in direction, someone is there to pick up what that means for individuals. That can be your supplier, who should be able to talk you through different approaches and hopefully offer you one if we get the consumer proposition right. It can also be the Government or trusted stakeholders like local authorities.

This is a personal view. It is not in the briefing I was given, but historically when we think through decarbonisation policy, we often do not think through the communication or engagement piece. That is especially key as we move into more personal areas of policymaking.



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The next thing is to think about making sure that vulnerable customers in particular demographics are looked after and that there is tailored information for them, too. There are lots of ways you can do it, but fundamentally we need to have the conversation. The Government's role is to be clear that this is happening because then lots of different people will move to have that conversation for you.

Q45 John McNally: I know that in my own area, Falkirk, we have done quite a lot with smart energy and trying to get local people engaged. We have organised plenty of events but trying to get to the people we need to get to is extremely difficult. That is at an early stage. Thank you very much for that.

Newcastle City Council and E.ON will install something like 250 heat pumps into suitable homes in Newcastle by March 2022. The heat pumps are completely free to the customer, with both private and social housing group-owned homes included. It predominantly focuses on homes that already have gas central heating installed.

However, in earlier stages of the project, they shared a number of results with this Committee. It was interesting to see that more than 70% of properties surveyed have resulted in cancellations for a number of reasons. However, the most frequent is the potential disruption and complexity of having a heat pump installed into the property.

Dr Porter, how can that disruption from heat pump installations and retrofits be minimised to cause the least disruption to properties and constituents?

Dr Porter: That is an unfortunate example that you have expressed to us. The problem is linked to installers and making sure installers are properly trained and understand what is required. I do not know the example you have described, but I would love to know who was involved in that. It does not sound like it was done very well. Was it explained correctly? What was the reason they were going to be done? Was it the right decision? How were the consumers involved from the start? They are the three questions I would ask. Then it is down to the technical aspect of making it valid. If the changes are properly explained, that goes a long way to helping acceptance, but we cannot deny that there are some technical and space issues involved in this.

We have been advocating for a number of years that you stop taking out hot-water tanks because it has to be there to have a heat pump. You cannot have an instantaneous hot water system from a heat pump. In many cases, we have taken out hot-water cylinders and, going back five or 10 years later to put a heat pump in, we suddenly have to find space for a bigger tank because they are using the space to store clothes or whatever. Those issues cannot be avoided. You have to have some things for heat pumps, and we cannot get around that.

The main thing is to make sure that the application is the correct one, that the installer is fully trained and that the householder or the agent



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advising them fully understands what is required and the options for the installation. That would be my suggestion.

Randolph Brazier: There is also a networks element here. Some of the disruption can come with upgrades to the network, particularly when there are cables involved.

What the CCC recommends is correct. They say to build it once and build it right. If we want to hit net zero in 2050, we do not want to go digging up pavements multiple times. We want to strategically invest ahead of need, do it once now and do it once right, which will minimise that disruption, particularly from the perspective of roads, pavements and driveways.

Q46 **John McNally:** That is an excellent point. Being a former councillor, it was a total nightmare sometimes when somebody would go in to repair a gas pipe and three weeks later somebody would go in for the electricity and then they would want to install something else. In some other countries, they have bonds that you have to pay and you have to notify. There is an incentive or a nudge there to make sure companies are all working together. I totally get that.

Emma Pinchbeck: First, I should say that the notes from my team literally say, "Do it once and do it well," but they were referring not networks but things like going in and doing energy efficiency and a heat pump at the same time, doing the whole thing for a customer in one go and minimising that intervention.

Secondly, at the moment the equation is stacked and you are getting disrupted. Too often the conversation is about the curse of decarbonisation, which people care about, but I argue they would care about it more if they could also see the energy services off the back of it, if they understand that it is the better technology and if they are getting a warmer, more convenient and more comfortable home. Many of my members are investing millions to work out how to have that conversation with customers, how to minimise the disruption and how to sell them this kit. Of course, it is because they care about decarbonisation but it is also because they can see the business proposition for them.

The market is limiting it. All the regulatory, policy and other nudges we have talked about through this conversation, and long-term targets, will help suppliers and other businesses do some of this work for us. The people who are good at marketing and selling will market and sell heat pumps if they can do it. That will include packaging the disruption as something that has bigger returns for customers over and above the right thing to do, which is to decarbonise.

Q47 **John McNally:** If somebody has a perfectly good gas boiler, they would be wondering if decarbonisation might be very well for the long term but not at this moment in time. There is a lot of work to be done in new



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developments with builders and so on. Training them would be an ideal way to start in any new housing.

Dr Rosenow, what behavioural changes are needed to operate a heat pump effectively? Maybe that follows on from what Emma has been speaking about.

Dr Rosenow: I am happy to answer that question, but before I do that I have one last, quick point.

There is already a lot of disruption in our homes when we renovate, often after we have bought a house, before it gets rented out or when we extend it. Trigger points are important opportunities to tie in the replacement of a heating system and minimise that disruption. Disrupt when there is already disruption to avoid adding disruption. That is an important point.

How do you operate a heat pump? You need to set the temperature that you want and then the heat pump does it for you. It is as easy as that. There are not that many applications yet, but they exist. I use them myself. You tell the system, "I want a temperature of 21 degrees between these hours and it can be a little bit cooler during these hours," and then it does it for you. You do not have to do much.

One important difference, though, is that you cannot come back after a two-week holiday when it has been cold and expect that the home will be warm 20 minutes after you turn on the heating. You have longer times for pre-heating with a heat pump. That is simply because it runs at a lower-flow temperature. When you touch your radiators, they will still be hot, but they will be cooler. It takes a little longer for the heat pump to ramp up to the desired temperature. That is an important difference.

There is probably more reliance on things like smart thermostats and phone apps and less on things like flicking a switch to turn the heating up. That is an important difference, but a lot of people already use that technology. If you make it as easy as possible, it should not be such a big change for customers.

Dr Porter: I had a conversation last week with the installer we are likely to use in the west of North Yorkshire for the heat pump installation I mentioned earlier. I asked him exactly that question, Jan. His company had been installing oil boilers for however many years and is now selling heat pumps. What is the biggest customer question he gets? He said exactly the same as Jan said. You have to tell people that they cannot turn the boiler on and expect it to be warm in half an hour. But once you have told them and once you have explained the system, it is not a problem, but you have to go through that process of explaining that you have to use this type of heating in a slightly different way. As Jan said, if you have the right controls, set the controls and it will work.

Emma Pinchbeck: I have two points on this. One is to embarrass myself as someone who heads up an energy trade body. I live in a house with a



gas boiler but we have a smart thermostat. I could not tell you what happens with the boiler when I turn the smart thermostat on or set it. It just happens. In the same way, I doubt consumers will expect to know the intricacies of how their heat pump works and nor should they. They will poke a box or poke an app on their phone and the heat pump will do it for them. It will be known technology that we therefore forget about.

In the interim, in this initial wave of installation, it is important to explain that it is a different kind of heat technology. I have a live example, which I still find funny to this day. I used to work for WWF, the NGO, which has a beautiful low-carbon headquarters in Surrey. As part of that move, they had a heat pump installed. The heat pump is effective but it took a few weeks in January for the traditional building maintenance team, who were used to using boilers, to realise that they could not jack it up to cover colder days. They had to give it time to build up. For a while they would do that and the heat pump would not work effectively. All it took was a conversation with someone who knew about heat pumps and, like magic, the building was fine. That is a complex building to heat with a heat pump and it works brilliantly.

As we get used to this technology in the first wave, we will probably need to do some engagement. But eventually, it should be as ordinary as a boiler.

Q48 John McNally: I know that outside my own area and around about we are doing quite a lot with these heat pumps. This brings me on to the question of this next generation coming on. I am sure this generation is going to be more mindful than certainly my generation was of the need to save energy as much as possible and use it as efficiently as possible.

Is there any work going on in colleges to make sure this is part of the whole education and technical training system?

Dr Porter: I know that a lot of the companies are doing a lot of training. I talked to one company this week in preparation for this session. The training manager said they had had 15,000 installers through this year. They had been telling them about heat pumps and some gas, but also about smart controls and how to use systems. A lot of that might not necessarily come from the colleges, but certainly installers are being educated.

There is a bigger concept here beyond heat pumps in terms of how, throughout the education process at all levels, the future zero-carbon agenda is highlighted. Maybe it should be part of the curriculum. I am not sure. But that goes wider because, once you have those people understanding that the future is zero carbon, many of these other messages to do with heating, transportation, not eating meat or whatever the issue happens to be, become part and parcel of what they understand their future will become. That is a much wider political issue than we can debate about heat pumps.



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Randolph Brazier: I did my master's thesis in education for sustainable development. It is coming into schools. It is a big focus area, not teaching it as a separate subject but including practical examples of sustainability within existing traditional subjects. You can think about sustainability as touching every subject at school. It is about bringing examples into existing subjects, not teaching it as a bespoke standalone topic. It is a big focus area in the education sector.

Chair: Thank you. I am afraid we are going to have to bring it to a conclusion. Somebody said to me earlier today that our universities need to move away from educating mechanical engineers about how to deal with internal combustion engines towards educating them about how to deal with electrical installations and everything we have been talking about today.

I would like to thank our panellists today, Emma Pinchbeck—and congratulations on putting out a comment on the Chancellor's statement during the course of our session today, which I have just read—Dr Jan Rosenow, Randolph Brazier and Dr Howard Porter, for your insightful contributions. Thank you to the members of the Committee for joining us today on a busy day in Parliament, and to Matt Smith and Jim Camp for organising our brief. Thank you very much indeed.