



HOUSE OF LORDS

Environment and Climate Change Committee

Corrected oral evidence: Boiler Upgrade Scheme

Wednesday 23 November 2022

10.55 pm

Watch the meeting

Members present: Baroness Parminter (The Chair); Baroness Boycott; Lord Browne of Ladyton; Lord Colgrain; Lord Lilley; Lord Lucas; Baroness Northover; The Lord Bishop of Oxford; The Duke of Wellington; Lord Whitty.

Evidence Session No. 4

Heard in Public

Questions 39 - 49

Witnesses

[I](#): Lee Brown, Operations Director, IMS Heat Pumps Ltd; Bean Beanland, Director for Growth & External Affairs, Heat Pump Federation; Mike Foster, CEO, Energy and Utilities Alliance.

Examination of witnesses

Lee Brown, Bean Beanland and Mike Foster.

Q39 The Chair: Thank you to the three witnesses on our second panel this morning, as we continue our inquiry into the Government's Boiler Upgrade Scheme. We are delighted to have you all with us. Lee Brown is the operations manager at IMS Heat Pumps; Bean Beanland is the director for growth and external affairs at the Heat Pump Federation; and Mike Foster is the chief executive of the Energy and Utilities Alliance. Welcome to you all, gentlemen.

We have a number of questions that you have already had some sight of but, as I am sure you will have noticed from the first panel, we will ask a number of supplementaries. The first question is that we would like your perspective on how heat pumps actually operate in the real world, which is something we touched on in the first panel. Perhaps I could address that first to Bean.

Bean Beanland: Good morning, and thank you very much indeed for the opportunity to address your committee. Naturally, you would expect me to say, "Very well indeed". One of the key starting points is to reassure everybody that you all already have heat pumps, and they all perform incredibly well. How often do you replace your fridge, your freezer, or your car air-conditioning? Heat pump technology is ubiquitous. Heat pumps done well function incredibly well. Clearly, any technology not done well will have its challenges. The major challenge for us in the UK now is to make sure that every heat pump we put in is done well. Provided we do that, the outcomes will be successful and consumer demand will absolutely build because people will see the success rate.

We have a wait at the moment for information from the Government's recent heat pump demonstrator programme, part of which was driven by OVO, which you heard from earlier. It did a third of the installations. That project installed nearly 750 heat pumps across the UK. The data is being collated, checked, scanned, sanitised, cleansed, or whatever BEIS and its advisers are doing with it, and we should start seeing the data coming through. We have encouraged BEIS to maintain ongoing monitoring of those schemes. The budget originally provided for a certain amount of monitoring, and I do not know quite how much, but clearly we would like to see monitoring going on for a number of heating seasons so that we can actually get some really sensible data.

Providing other additional hard data is very difficult. For average homes the heat load is relatively modest for much of the year, and measuring heat is difficult and expensive. Measuring electricity flow is very easy and measuring gas flow is relatively easy; but measuring heat—thermal metering—is expensive and difficult to do well, because in shoulder months of the year, spring and autumn, the demand for heat is very low, so heat flows are low, and metering them is a challenge, as has been demonstrated in the past. For instance, in the renewable heat premium

payment scheme, there were metered installations, and at least 50% of the data was proven to be inappropriate. It is a challenge.

Getting hard data is a problem, but we can get de facto information from the heat pumps themselves because they record the amount of electricity that they use throughout the year; in fact, the MCS standard requires an additional meter so that we can check other elements in the system apart from just the heat pump itself. Most controllers provide some form of inbuilt metering. It is not thermal metering; it does it by algorithm. So it is not perfect, but it gives us a reasonable show, and from that you can get some understanding of the seasonal performance factor.

The coefficient of performance, which you presumably are aware of, is an instantaneous measure. What we are really interested in is the seasonal performance factor, which is the annual performance, because, of course, the performance of a heat pump, particularly air source, will ebb and flow during the year depending on the air temperature and the heat demand. Sorry, that was quite a long-winded answer.

The Chair: No, it was very helpful. Thank you.

Lee Brown: We found, going out in the field, that it is all down to design. As long as the design is good, which takes a lot of time and good knowledge, once we have the installation in and are monitoring it, with all the online equipment that is on board the heat pump units, we are getting good data and the systems are working well. We have some energy assessors, who are our customers, monitoring their systems with third-party equipment and getting good results. As Bean says, it is down to design.

Mike Foster: Addressing this as the chief executive of a trade association whose members make heat pumps, boilers and heat interface units for heat networks, I am bound to say that heat pumps work. They work well, but they work well in the right circumstance—being fitted into the right home with the right thermal properties of the building.

To echo what Bean said, when they are installed correctly they indeed work well. The definition of what working well actually means is the driving factor that should be considered for all consumers. It is about affordability. It is about the comfort and warmth in your property. When they are not fitted well, you have expensive-to-run heat pumps and you have the risk of a cold home not to the comfort levels that you were previously used to. The design is absolutely key, but more important than that is the actual infrastructure into which the heat pump will be fitted.

As the previous session explored, not all properties are suitable for heat pumps. We have done a considerable amount of work looking at housing infrastructure. We have identified external challenges to fitting heat pumps to replace gas boilers, and those external challenges are the space, the requirements that you need physically outside your property. Your previous witness from OVO found that with his glass-backed terrace house he could not have a heat pump. That is one of the limitations.

Space for your neighbours, with the respective noise limits that are placed on heat pumps, is also a limiting factor.

The big one is external walls built pre-1919. They are solid walls. They are not very thermally efficient and they can lead to high running costs if insulation is not dealt with. It is very expensive to provide external wall insulation. It has to be done incredibly well, otherwise you end up with the horror stories that you sometimes pick up in newspapers when insulation is fitted badly.

There are internal challenges to the home. Not all homes have hot water cylinders. The majority do not have hot water cylinders. Space has to be found to put those in, as well as the necessary pipework. As was said in the previous evidence session, radiators may need to be changed because heat pumps operate at a lower temperature, so you need a larger radiator, or emitter as they call them. Lord Lilley, your good lady is absolutely correct.

Lord Lilley: She always is.

Mike Foster: Interestingly, the one thing that came out of the low-carbon heat demonstrator trials that have been referred to was the problem of microbore pipes, which exist in modern buildings that were deemed to be thermally efficient. They have cavity wall insulation and loft insulation, but if they have microbore pipe, typically 10 millimetre or narrower diameter, compared with the conventional 15 millimetre or 22 millimetre pipe, they may need to be re-piped.

Indeed, one of the questions that I would love to have been in your position to ask Octopus is whether, when it does its initial assessment, one of the first questions it asks is, "Does your home have microbore?" If it does, you will not get an Octopus heat pump fitted and you will not be first in the queue because of the limitations and the cost to put right the microbore situation.

The Chair: To be fair to Octopus, I think it made it clear that it was looking at that issue. Bean, would you like to come back on any of the extensive concerns that Mr Foster outlined?

Bean Beanland: The building has no idea what the heat source is. A building will leak heat. It will leak heat from a gas boiler, from a hydrogen boiler, from a biomass boiler and from a heat pump. It does not know where the heat is coming from. The concept that a building will leak more because it has a heat pump in it is false. The issue is whether or not you want to leak cheap, high-carbon heat, or expensive, low-carbon heat. That is the choice the country has to make.

At the moment, we artificially manipulate primary energy markets so that gas is relatively cheap and electricity is relatively expensive. If electricity was at a lower cost, the challenge of putting heat pumps into leakier buildings would be a false one because the heat would be so much cheaper anyway.

On putting heat pumps into leaky buildings, we have just done Bath Abbey. It is difficult to imagine a leakier building than Bath Abbey. That now has a heat pump in it. The National Trust is now routinely putting heat pumps into its properties because it decided that burning biomass is not attractive to its members.

The question about flow temperatures is also interesting, because building regulations have just been changed, in June. There is now a mandate to design all emitter systems at 55 degrees Celsius or less, which for the first time acknowledges that condensing boilers are low flow temperature heat devices. Seventeen years after the mandate for fitting condensing boilers in 2005, building regulations have now caught up to mandate that they are installed in a condition in which they are much more likely to operate in condensing mode; 55 degrees for a weather-compensated heat pump, for the small number of hours a year when it needs to do 55 degrees, is perfectly achievable.

The Chair: The Bishop of Oxford has his hand up. You mention Bath Abbey and the Bishop comes in.

Q40 The Lord Bishop of Oxford: I will explore Bath Abbey. My question is for you, Mike Foster, because your evidence is running slightly counter to other evidence that we have heard. What is your picture, or vision, of the mix of zero-carbon heating that we will need to achieve across the UK if it is not predominantly air source heat pumps?

Mike Foster: We very much follow the government lead on looking at three broad technologies—heat pumps for the right property, heat networks and hydrogen gas boilers—as the three solutions that we think are viable going forward and will give us a net-zero option, partly predicated, as I mentioned, on our current housing stock. It is not going to disappear by 2050.

When designing new build, you should absolutely be looking at installing from scratch either ground source heat pumps, air source heat pumps, low-carbon heat networks or, in some circumstances, direct electric heating, because the heat load, in theory, from a well-designed, new-build property will not necessitate a gas boiler to do what gas boilers have traditionally done in UK housing stock. Dealing with the retrofit situation is where we think hydrogen will have a key part to play, purely because not all homes will be suitable for the heat pump technology. Not all people will want to be connected to a heat network. They will want to have choice as individual consumers in how they heat their home.

A broader, more political, issue has to be addressed, and that is how you deal with individuals who are not able to afford to move to some of these technologies and will remain on gas. Gas has to be decarbonised. Everybody absolutely accepts that and is working towards it, but the costs of the gas network are still going to be there even when you start to lose consumers. The same costs will be incurred, and those costs are increasingly going to be borne on a smaller, in effect, meter-based consumer base of individuals. There is an argument about whether that

will be equitable for those left on the gas network, and therefore whether they will be locked into high fixed costs of maintaining the gas network.

Ultimately, there is the question: if you go down the all-electrification route, what happens to the gas network? Who pays for the costs of it being decommissioned? Nobody has explored how those costs will be shared out. Is it just on the people who are left on the gas network, who, again, will probably be the least well-off in our communities. That would seem to me utterly unfair.

There are lots of issues with the choice of technologies, let alone how you meet peak heat demand, which is the one that people developing energy systems really focus on. How do you deal with the beast from the east, that one in 20-year cold scenario when the wind is not blowing and it is winter, the sun is not shining and it is incredibly cold? Gas as a form of delivery of heat has the flexibility to be stored and to be used when it is the appropriate time to do so. That is why we think there is a gas solution.

The appropriate mix of those three technologies, for us, is very much about it being up to consumers to decide what they want for their homes. As long as the net-zero options are the only three options available, it is about the market price, what the economics show, and letting consumers make that decision.

Q41 Lord Whitty: I was with you until you said that it was up to consumers to decide. There are two points. One is that a hydrogen-based gas supply requires the network to be there. It requires some continuation of the network, and, as you rightly say, who pays for it? It also requires hydrogen or a hydrogen blend to be available reasonably cheaply. The problem is that the overall scenario is that hydrogen is seen as the get-out-of-jail-free ability for dealing with heavy-user industries, from aviation to shipping. Everybody has the idea that hydrogen will solve their problem.

At the moment, we do not have green hydrogen. We certainly do not have green hydrogen at scale. If hydrogen is to be a part of the solution, we have to make sure that we have the right sort of hydrogen and we have to define very clearly which houses or which geographical areas are going to retain a gas network. There will be a difficult political decision and a difficult economic decision about who bears the cost. Considering that you raised this, Mike, roughly what proportion of the country do you see having a relatively easy move from gas to a hydrogen-based solution?

Mike Foster: We have a report that I am more than happy to send through separately. In the housing structure that we have at the moment, we think that, roughly speaking, 8 million to 12 million homes are unlikely ever to have the right thermal properties to have heat pumps; 3 million to 4 million can get away with minor improvements such as loft cavity wall insulation; and about 7 million to 10 million are perfectly suitable for heat pumps at the moment.

As to where we think we might end up come 2050, at the moment 85% of homes are currently on the gas grid, and we are probably talking about 60% or 70% at the most. It may even go down as low as 50% of homes. It is that sort of ballpark figure.

The Chair: Thank you. Clearly, there are differences of opinion in this panel, which is interesting, challenging and invigorating for us.

Q42 **Lord Browne of Ladyton:** Like all parliamentarians in this building, my inbox is full of emails from people who tell me that they represent businesses or innovation or academic environments that have the solution to all the problems, or one of the problems, of climate change. It overwhelms all of us, to be honest. It is not that we want to do this, but most of them go straight to "Delete", because it would be impossible for us to keep up. We rely on people who give us evidence that these are all-of-society problems to give us all-of-society solutions.

Energising as this competition is, is there any space in which people who have the alliance's approach to decarbonising heating buildings and those who have the air source heat pumps approach get together to see if networking can help solve these problems? It seems to me that, given the reality of our properties, the problems are there, and it is a common challenge, so it would be much more helpful to us if you were working together to try to solve those problems, because then we could encourage the Government to engage with you together in an all-of-society approach. Do you meet together to help solve those problems together, or do you compete?

Bean Beanland: Historically, clearly there has been a degree of competition, but, as Mike has already alluded to, he now has members who manufacture both boilers and heat pumps, as do we. There is now a significant and growing degree of crossover. The point that you raise is very interesting. It may be that, as the gas network shrinks, collaboration is required to identify the areas where we might start shrinking the network. Bringing the distribution network operators in so that the electrical network is improved in the same area is the sort of thing where collaboration is required.

I must tell you that we have long held the view that the challenge we are faced with not just in this country but globally is so enormous that we are going to require collaboration, collaboration and more collaboration, and that includes at the heart of government. What happens at the heart of government also needs to change. There is a degree of, "We've always done it like this", which is a hindrance to advances, and a hindrance specifically in my instance to the decarbonisation of the UK.

Mike Foster: I absolutely echo what Bean said. The trade association world, I am afraid, is fraught with competition, where technologies compete against each other, but our members, as I said, make equipment for all of the three technologies that the Government are looking at to achieve decarbonisation. Yes, it is polarised, and it is not right that it is polarised, but that is just the nature of the beast at the

moment. A much healthier position to be in would be where people were looking at, and having a debate about, numbers and proportions and what parts of the country or what type of home has what technology, accepting that all three technologies have a role to play. At the moment, unfortunately, not everybody believes that all three technologies should be used going forward, and that needs to be looked at.

On Bean's second point about BEIS not always being joined up in its thinking, as an example of some of the areas where we could do better, at the moment there is a road map that looks at hydrogen. We have had the initial HyDeploy trials. We are moving on to hydrogen villages to look at the manner in which homes can be converted. We do not have the equivalent for areas that will only be on an electrified option. It would be a useful exercise to have a heat pump village trial of about 2,000 properties to mirror what is currently going on with hydrogen to see what the challenges and limitations are.

As much as there are challenges about where we get green hydrogen, there are also massive challenges about how we upgrade the electricity network to carry the extra load that will be required for heating and electric vehicles. We need a level playing field among all technologies so that we can see exactly what the requirements will be. There are huge costs at stake, and nobody has yet, in my opinion, defined how they will be paid for by consumers and the manner in which they will be paid for by consumers, because that too can vary depending on which option is chosen.

Q43 Lord Colgrain: Can I come back to you, Bean, on Bath Abbey and the National Trust buildings? The thrust of our investigations is towards residential domestic buildings, but we hope that whatever technology proves to be successful in the future could be applied in commercial and much bigger buildings. In the examples you have given us, are you talking about ground source heat pumps or air source heat pumps?

Bean Beanland: The systems going into period and listed buildings tend to be ground source, but that is primarily led by ready availability of land, or a heat source in the case of Bath Abbey. Bath Abbey is rather poetic. If I take some licence, I have a 1,000 year-old building being heated by 2,000 year-old wastewater, because the source is the Roman baths. It is beautiful. It is poetry in motion. It tends to be ground source.

Having said that, many of the commercial schemes that are going in under the public sector decarbonisation scheme are large air source. The key for us as an industry is to determine the particular technology, within our own group of electrified heat, or combination thereof. Swaffham Prior in Cambridgeshire, which you may have heard about already, is a heat network at village scale with about 320 properties in the end, if they are all on, and that is a combination of ground source and air source.

Lord Colgrain: I think we have been given the impression that air source pumps only have a limited capacity in terms of size of building, but I understand you to be saying that actually you can have a bigger

system for a bigger building. Is that right?

Bean Beanland: Yes, absolutely. We have manufacturer members and manufacturers in the UK now producing state-of-the-art, low global warming-potential air source and ground source heat pumps for large commercial applications. You may have seen the news earlier in the week about Waitrose. Most of those are big air source schemes. We have the technology here in the UK. We have a marvellous export opportunity because we are leading the way in low global warming-potential natural refrigerants. There are some real opportunities for the UK getting away.

To bring this back to domestic scale, the average domestic heat load in the UK is about 8 kilowatts to 10 kilowatts, or probably a bit less now as we are bringing on more new build. The biggest selling boiler range in the UK at the moment is a combi boiler that sits somewhere between 28 kilowatts and 34 kilowatts. It is enormous compared with the heat load. They modulate down now, but the air source heat pumps will also modulate. All the technologies will scale down for domestic properties.

The question of choice is interesting. If you live on the gas network at the moment, you have very little choice. Because gas is so cheap, you would be a fool not to connect to it. I am not sure that is choice, and I suspect the same applies to hydrogen. It also applies to heat networks that are driven by heat pumps—it absolutely does—but we will have to determine, in dense urban environments for example, whether heat networks are a good idea, and whether in that instance we are merely transferring from one monopoly, a gas main, to another monopoly, which is a heat main. The key is to make sure that we regulate those effectively so that consumers are protected. There are marvellous opportunities in urban environments to scavenge waste heat and produce effective, very efficient heat networks for the benefit of not only the consumer but UK plc.

Mike Foster: Could I clarify something, Baroness Parminter?

The Chair: You can make a comment and we will see if it is a clarification.

Mike Foster: It is a bit of both. Bean mentioned the 28-kilowatt boiler and gave the impression that it was somewhat oversized for the thermal need of the property. The size of that boiler is to deliver hot water instantaneously, so it is a combi boiler. It does not require heat to be stored in a hot water tank. That is why the boiler is sized at 28 kilowatts when the heat load is only 10: because you need the extra capacity to generate instantaneous hot water.

Bean Beanland: That is true. It creates other technical problems, but we will not go into that.

The Chair: I feel as if I am compering a boxing match. Lord Colgrain, would you like to ask the second question?

Q44 **Lord Colgrain:** Lee, perhaps I can direct this at you first. What are the

pros and cons of the current design and administration of the Boiler Upgrade Scheme? Is the scale of the scheme appropriate alongside other measures that are currently in place?

Lee Brown: We found the scheme to be relatively good when it works, even though it is still at its early stages. There are minimum criteria that you have to adhere to, and when those are all met the scheme is pretty streamlined. The online application is coming soon, so hopefully that will be even better. Where we have found issues is when the criteria have not been met. As it is an installer-led scheme, we are the piggy in the middle trying to administer it, and that is where we have found issues.

We are quite lucky, because even though we are not at the scale of Octopus—we are a relatively smaller outfit—we have back-office staff who take care of that. If you were a smaller outfit, having to design systems, having to go out there and install them and cover administration of the BUS, it would be difficult. We are quite lucky in that respect.

Mike Foster: I am yet to be convinced that the scheme really knows what it is trying to do, other than just subsidise installation, because there are better ways to save carbon with that amount of money at your disposal. You would be much better off putting it into energy efficiency to get the same carbon savings. I struggle to see whether carbon is the driver for the Boiler Upgrade Scheme.

There are no safeguards around additionality, so we do not know whether the people who will get the subsidy were going to have a heat pump anyway, and this is just £5,000 off the cost of doing so. That is a concern because the average cost of an air source heat pump under the upgrade scheme is just shy of £13,000. If you get a £5,000 subsidy, clearly you are putting in £8,000 yourself. Not everybody can afford to do that. Is taxpayers' money being skewed to a certain section of our communities? I struggle on that front.

The changes that were made from the renewable heat incentive have led to some switch in the products that are being fitted now. The previous renewable heat incentive scheme was probably more generous to ground source heat pumps than the current one, and we have seen a change in the mix of products coming through. Previously, we had been looking at something like five air source heat pumps to each ground source heat pump. Now, it is 36 air source heat pumps to each ground source heat pump being fitted. There is an impact, it seems, of this scheme, and it is skewing the nature of the heat pumps being fitted.

The consequences of that are felt at home, because the UK has a stronger lead globally in supplying ground source heat pumps. I think 41% of ground source heat pumps sold in the UK are sourced from the UK, whereas only 30% of air source heat pumps sold in the UK are sourced from the UK, so you are skewing your subsidy to favour imported heat pumps, which I do not think was the intention of the scheme. There are some issues with the scheme.

I have some comments for later about what we found direct from installers, which I am more than happy to share almost verbatim from the notes I took down from talking to them. They echo pretty much what Lee said. They like the scheme, but there are challenges with it at a very practical level.

Bean Beanland: The sociopolitical question is one for the Government. They have created this scheme to seed the market. We have schemes that are aimed at social housing and households that are less well off. We have the social housing decarbonisation fund. We have the home upgrade grant. There are schemes already that target lower-income households. From my perspective, if we get the price of electricity right and we provide some thermal storage, we can deliver the lowest cost energy to those poorer households tomorrow.

At 30,000 units a year, the scale of the scheme is modest, but it mirrors what the market was delivering towards the end of the renewable heat incentive. Approximately 50% of heat pumps going in are not eligible for funding in any way, so the market is that much greater. The scheme has been throttled. Uptake has not been as good as we would like and certainly is not meeting the average run rate required to deliver 30,000 units a year yet, but there have been challenges. The launch was not great technically. Ofgem was ill prepared, but it has run pretty hard to catch up, and the online portal that Lee referred to goes live on 28 November, so that will make a difference. Installers are reporting that they have the hang of it.

We have already touched on the issue about cash flow and the fact that the smaller installer is out of pocket to the tune of £5,000 until the voucher is redeemed. The problem for a lot of very small installers is that if the scheme is audited that delays payment, and if they have done three or four of these a month and they are all being audited that is a £20,000 hole in their cash flow. For many people, that is paying the mortgage. There are some issues.

If I was to look at the demographic, you have government, manufacturers, installers and consumers, and the financial burden is being placed on one of the two that are least able to cope with it. I am not sure that the financial burden was put in the best place. We had the simultaneous introduction of zero-rated VAT for most domestic installs. Ministers, when they made their decision in the Budget, assumed that that meant all domestic installs. That actually is not true yet, and we are working on that. They are carrying the VAT as well as carrying the Boiler Upgrade Scheme. There is a bit of a double hit, mostly during monthly accounting on VAT now, which is good. That was a problem.

Mike is absolutely correct that the scheme has picked a winner, in that sales have transformed. In the last three months of the renewable heat incentive, 16% of heat pumps were ground source. Currently, we are running at about 1.5%. That is because the additional grant moneys available for ground source are too low; they do not cover the additional cost. From UK plc's perspective, ground source is a better technology;

you need less electricity because the pumps are inherently, comparing like-for-like quality, more efficient in the UK climate. It is a shame that we are not equally encouraging ground source, but I have always been of the view that, as we get the hang of these technologies, ground source will start to gain an increasing share of the market because scavenging waste heat for heat networks is a ground source application.

With new build, housebuilders will start to realise that they can deliver cooling very effectively from ground source. The houses do not have the units sitting outside, so there is a visual improvement. We already have new financial models coming through where the ground array is owned by somebody else, so the developer only has to say, "I'll buy the ground source heat pump. I don't have to put up anything on the outside. It can cope with doing hot water as well. Oh, and I can deliver cooling". Most housebuilders now report more complaints about overheating than about heating and hot water.

There are opportunities for ground source outside the scheme, but it is a shame that it picked a winner. It is designed to seed the market. There are things that could be done to improve the uptake, and I do not know whether that comes down in the end—

The Chair: Please hold that for the moment, because we have two supplementaries on it and then we will move on.

Q45 **Lord Browne of Ladyton:** I have a very specific supplementary for Mike. You helpfully answered the question I have been trying to get an answer to, which is about the percentage of heat pumps domestic manufacturers are making. The data is not of complete use to me unless there is some comparison. What percentage of gas boilers that are installed in this country are manufactured in the United Kingdom?

Mike Foster: Over 90%.

Lord Browne of Ladyton: Over 90% of those installed are manufactured in the United Kingdom.

Mike Foster: There are four main boiler manufacturers in the UK: Ideal, Vaillant, Worcester Bosch and Baxi. The largest air source heat pump manufacturer in the UK is Mitsubishi, based in Scotland.

The Chair: Thank you for that.

Q46 **Lord Lucas:** How would you change the scheme to encourage more manufacturing? Bean, you said there are some improvements that the Government could make in the way it was running. Can you write to us about that?

Bean Beanland: I will. Perhaps I could make a correction for the record. Mike assumed I was talking about BEIS. Actually, I was not. BEIS is performing very well.

The Chair: Which department were you talking about?

Bean Beanland: The problem that applies to the scheme with the issue about rolling funds sits in Treasury. I was very interested that Mark from OVO requested the ability to roll the funds from year to year. We have the same problem with Treasury with other schemes where it sets defined time limits that are inappropriate. It has just launched a £1 million training scheme—we talked about training—and it has given the company that was going to administer it until the end of March to spend the money. We are in the middle of the heating season. All the installers are flat out. That is poorly thought through.

The one change I would love to see in Treasury is that it finds a mechanism to allow us to roll budgets, because at the moment, and this applies to all the schemes—the social housing decarbonisation fund, the public sector decarbonisation scheme, the whole lot—they come with timeframes that do not recognise what the industry is doing now and is capable of doing as it ramps up. That needs seriously looking at, and if that was one of the outcomes from this inquiry I would be delighted.

Lord Lucas: To come back to my main question—

Bean Beanland: Sorry, what was the first question?

Lord Lucas: Are there any ways we can adjust the scheme to encourage more manufacturing in the UK?

Bean Beanland: Manufacturing in the UK is already increasing. Mike referred to Vaillant. It has one line running already at its headquarters in Belper and is building a second. What will be interesting is when we see other manufacturers converting boiler lines to heat pump lines. On encouraging UK manufacture, Mike referred to Kensa in Cornwall. Its growth rate has been prodigious. We have heard Octopus refer to RED in Northern Ireland, a lovely home-grown machine. It is particularly nice because it is built specifically to accommodate the UK climate, which is quite specific, so that is a really good opportunity.

In terms of encouraging more in, we have had some schemes about putting money into manufacturing. When I talk to our manufacturing members, they say, "Yeah, but we have already done that so we can't access that money. It's the next bit we need". It is the ability to move from R&D to scaling manufacture, to take advantage of growth not just in the domestic market but, as I alluded to earlier, in the commercial sector, because the commercial sector is running fast. A lot of businesses, I believe, are decarbonising and are pursuing a decarbonisation programme almost in spite of the Government at the moment.

Q47 **Lord Browne of Ladyton:** I think all of you were sitting at the back when I asked this question before. The introduction to it is that we have heard consistent evidence about the restriction generated by the skills and capacity issue. What is in the pipeline as far as new certified installers and assessors of heat pumps are concerned? I had hoped that the witness from Octopus might be able to give me an impression of that, but I am sure, Bean, you can give me the precise details.

Bean Beanland: Other brands are available. Octopus, I must declare, are members of the federation. Training absolutely has been front and centre of our industry for several years. I believe the Heat Pump Association has current capacity within its membership of manufacturers—air source manufacturers, largely—to train about 12,000 engineers a year. The problem is: where are those 12,000 engineers going to come from? Why will they want to take the training? As you probably know from your own experience, if you take some training or any education at all, and you then do not use it for a year, you might as well not have bothered. We have to build the training capacity and pull through the people being trained at a rate that is met by the creation of the market.

At the moment, if I was a gas fitter, I would be saying, “The future homes standard is nowhere near the statute book yet. It could be pie in the sky and might never happen. The off-gas consultation is buried somewhere and probably never going to happen. I’m really busy at the moment. I’m earning good money. Why should I take the training for something that I probably won’t install for a number of years?” We have to provide visibility of the market so that the existing fossil fuel installers want to take it up.

The future homes standard has the potential to deliver a significant number of properties a year. The off-gas consultations have the same ability to deliver a significant number of properties a year. Between the two of them, they could deliver 600,000 units a year. Of course, from the Government’s perspective, that is the magic number. If we had those two brought forward at pace and clear commentary from the Government that hydrogen networks will not go where the gas network is not yet, all the rural homes that are currently on oil and LBG are absolutely going to have to rise to the challenge of being early adopters. We are going to have to find ways of helping them. That is a challenge that we are discussing currently around the long-term affordability package, which I would suggest needs something along the lines of a lend-lease programme. The money required will be enormous.

Lord Browne of Ladyton: In this chicken and egg environment, we heard evidence just an hour or so ago from Octopus that it had space for 1,000 trainees and it had 3,000 applicants. It is massively oversubscribed. Your colleagues have space for 12,000. Is Octopus unique in this if your capacity is not being used up?

Bean Beanland: I think Octopus is slightly unique. Clearly, it has a very interesting brand, so it attracts. What it says to those installers is that it is going to create a market because of its market proposition. If it is creating its market it will attract, but we need much bigger market creation, and that visibility comes from other strands of policy, I believe.

Lord Browne of Ladyton: Lee, can your business find installers easily?

Lee Brown: No, it is a big problem. We have to bring guys on board. We have had guys who were gas engineers earning quite a lot of money

doing projects, and when we get them on board there is a big gap in their knowledge of system designs and things like that and what we are looking to try to do. We find that we have to bring in younger people who have more background knowledge of the fundamentals and we have to train them in what we want them to do. We have to do that ourselves. We are only a relatively small company. The training that we are trying to get from colleges is difficult because it is not quite there yet, so we just have to get people with fundamental knowledge and direct them where we want them.

Lord Browne of Ladyton: Mike, your members, if I understood your evidence correctly, are installing heat pumps. Are they training people who were otherwise gas installers?

Mike Foster: The bulk of the training for gas boiler installations, potentially for heat pump installations when the demand is there and for solar, is delivered by manufacturers at the moment, a bit as Octopus described how it did its training. The big four boiler manufacturers have the capacity to deliver something in the region of 25,000 training places each year, so the scale, potentially, is enormous for the boiler manufacturers to deliver.

Bean quite rightly pointed to the challenges around demand and that driving the desire to get trained. We think there is a gap in the system at the moment where if you want to have a heat pump installed under the Boiler Upgrade Scheme you have to be MCS—microgeneration certification scheme—certified, but if you want to have your heat pump installed outside the scheme you do not. It makes sense for us to have the best trained installers doing the work regardless of whether it is a government-subsidised scheme or whether the consumer is funding it wholly. We think that all heat pump installs should be done by accredited installers. It drives some of the need for other installers to get the appropriate training to do the systems design, et cetera, that Lee mentioned, because the sensitivity of a poorly installed heat pump to the running cost is enormous.

It has to be done right, because a seasonal performance factor of 2.5 gives a completely different consumer outcome from a factor of 3. Roughly speaking, 3 is parity with a gas boiler. Anything below 3, you are worse off having a heat pump than having a gas boiler, so getting it done right is important. Interestingly, the Boiler Upgrade Scheme only determines that you need efficiency of 2.8. Again, it is a little flaw in the scheme. We think having more demand for MCS accreditation is the way we drive people to get trained. It is expensive, because an installer has to pay for the course and they have to take time off work when they are not doing jobs, and that has to be looked at as well.

We think there are two areas that the Government could look at on this front. One is the current Energy Bill, which is paused at the moment in the Lords. In that Bill there is a section about what is called the market mechanism. The market mechanism is a way of potentially

incentivising/penalising—it depends on which view you have—boiler manufacturers to make heat pumps.

We have argued that it would be a much better use of the market mechanism to have the boiler manufacturers incentivised/encouraged to train people to be heat pump installers. That would be a much better mechanism for the market-based approach, so that instead of boiler manufacturers seemingly being punished for producing hydrogen-ready boilers, which the Government want them to do, it would be much better if they were incentivised and encouraged to train people to do the full range of technologies that will be needed—hydrogen boilers, heat pumps and heat networks. That is the better way, we think, going forward, and that is one aspect that could be done.

Mike Foster: The second point about encouraging installers to be trained is to look at something like the MCS itself. At the moment, any surplus that the MCS makes goes to a charitable foundation to do whatever they want with it. They could actually use it to train more installers or to reduce the cost of the training, and that would be a useful way in which resources were spent to encourage more people to be trained.

Q48 The Duke of Wellington: I must first declare an interest. On my family's Hampshire estate, we are, in fact, employing Mr Beanland as a consultant. I want to make that clear.

This question revolves around other difficulties of installing low-carbon heating systems. Are there planning requirements in conservation areas? One has to get permission even to repaint one's house. Does one have to get permission to install a heat pump? Do you have any views on that? Are there legal constraints on noise emission, appearance or anything else that would inhibit in any way the installation of such systems?

Bean Beanland: Yes, there are issues such as permitted development rights. I think I am right in saying that we are currently running with legislation that dates from 2015; it might be 2017. All low-carbon technologies are advancing at pace and changing at pace. Permitted development rights are way behind. It is also a devolved issue.

In Northern Ireland, there are effectively no permitted development rights at all for air source heat pumps because you need a distance to the boundary of something like 50 feet or 100 feet. It is ludicrous. There is effectively no permitted development right in Northern Ireland. The GLA did some work on permitted development rights a couple of years ago. I have not seen the report yet. I would quite like to see it. We contributed to the work on that.

PDR, permitted development rights, are given to air source and ground source heat pumps. Air source has a stipulation that the box on the outside of the building is less than 0.6 cubic metres in volume. I think that is the wrong way round; they should be bigger, not smaller, because if they are bigger they are more efficient, but that is another question.

On putting units into conservation areas and sensitive spots, we have creative manufacturers and installers now who are skinning devices so that they have a skin that looks like a Cotswold stone wall. They are painting them terracotta to go on a red brick building. They are painting them green to go in rural environments. The RED, which we heard that Octopus has purchased, is a cylindrical machine. It is a different form factor. It is not boxy; it is cylindrical. If you paint that green and put it in a rural garden, it looks like a composter. Your visual impact can be mitigated given that people who are off the gas grid currently have an oil tank or a Calor gas tank sitting in the garden. There are things that can be done.

PDR needs to be looked at and there needs to be a mechanism that allows it to keep up with the pace of change of the technologies. There are just single letters missing—"a" heat pump. If you need two, you do not get permitted development rights. Very small things like that could be tweaked, which would make a big difference.

Lee Brown: I echo Bean's comments. It is quite restrictive. Most machines do not need 1 metre of operating clearance, but you have to adhere to that for boundaries. We are trying to get the machines more efficient, which makes them bigger and quieter, and that obviously hinders because of the 0.6 cubic metre restriction. For smaller properties, it becomes a real hindrance because you are limited to outside space for siting equipment. It becomes a real problem.

Q49 **Baroness Northover:** What arrangements are in place for the disposal, reuse and recycling of old heat systems, and are they adequate?

Mike Foster: Currently, what would happen with an old gas boiler system that was taken out and replaced with an alternative is that, typically, installers would strip the boiler of any useful parts and it would just go off to a commercial recycling scheme. They are commercial activities.

Thinking ahead to where we might be from 2030 onwards, when we start to recycle heat pumps as part of their natural life cycle, there is some concern about F gas release because of the effect in magnifying its global warming potential. There are some concerns about how we deal with F gas and F gases being released during recycling, and that is something the industry has to nail down. I know it is looking at it. I know BEIS is looking at it. Because of the global warming potential, it needs to be further addressed.

Baroness Northover: What is F gas?

Mike Foster: F gases deliver refrigerant. They are used in the heat pump to compress and use that heat.

Noble Lords: Fluorocarbons?

Mike Foster: The global factor for F gases varies according to the type of F gas. There could be F gases that are 2,000 times more dangerous than carbon dioxide in their emission potential.

The Chair: Are they not used in fridges and freezers at the moment? This is not a new worry.

Mike Foster: It is not new, but it is on a different scale.

Baroness Northover: Lee, do you have any comments?

Lee Brown: A similar thing, really; it is like fridges. There is not really a disposable avenue. We as a company do it responsibly, degassing and disposing of them and then making use of the parts—doing what we can do. There is obviously some cost to us in doing that, so we have to factor that in to the customer. If there is another avenue like the disposal of fridges, it would help.

Bean Beanland: There is a mature market in disposal of fridges in terms of F gas. As I said earlier, we are increasingly moving towards low global warming-potential refrigerant gases. The issue of global warming potential will start to decrease with time. Clearly, we will have heat pumps with existing refrigerants in them for the next 20 years, because that is the sort of life cycle we are talking about, but there are mature mechanisms already in place for recovery of F gas.

Of course, those gases have a value. Because they have a value, it is incumbent on industry to want to recover them. You will need to keep other systems running that might need to be re-gassed. There are all sorts of reasons why you would want to recover. I think the industry will rise to that and will borrow a lot of the set-ups that are already in place to deal with fridges, deep freezers, car air-conditioning and any other places where you find F gases, because they are ubiquitous.

Lord Whitty: This is not a question, but could we have from any of you any detailed points about the machinery of government, particularly what Bean said about the role of the Treasury and the different bits of BEIS? If we had that in detail, it would be helpful.

The Chair: Those reflections from Mike on BEIS and Bean on the Treasury would be extremely helpful for our comments. I thank our three panellists. It has been really interesting and fascinating to have different perspectives, which will help us in our deliberations on this matter. Thank you, Bean, Lee and Mike for your time today and for sitting in on the first session. It is always helpful when panellists are able to respond to that.