

Energy Security and Net Zero Committee

Oral evidence: [Heating our homes](#), HC 115

Wednesday 13 December 2023

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Members present: Angus Brendan MacNeil (Chair); Vicky Ford; Mark Garnier; Mark Pawsey and Lloyd Russell-Moyle.

Questions 165 - 278

Witnesses

I: Charlotte Lee, Chief Executive, Heat Pump Association; Dr Tony Ballance, Chief Strategy and Regulation Officer, Cadent Gas; and Mike Foster, CEO, Energy and Utilities Alliance.

II: Professor Nick Eyre, Director, Centre for Research into Energy Demand Solutions; Jody Pittaway, Sector Director for Heat Networks, SSE; and George Webb, CEO, Liquid Gas UK.

Written evidence from witnesses:

- [Heat Pump Association](#)
- [Cadent Gas](#)
- [Energy and Utilities Alliance](#)
- [Centre for Research into Energy Demand Solutions](#)
- [SSE](#)
- [Liquid Gas UK](#)

Examination of witnesses

Witnesses: Charlotte Lee, Dr Tony Ballance and Mike Foster.

Q165 **Chair:** Good morning and welcome to the Energy Security and Net Zero Committee. This is the second session of the heating our homes inquiry and we are looking at technology and innovation. We have two panels of three witnesses this morning. May I ask the panel in front of me to introduce themselves, name, rank and serial number as always, please?

Mark Pawsey: Before they do that, Chair, may I put on record that Cadent are headquartered in my constituency, and I have met with them on a number of occasions?

Chair: Thank you very much for that, Mark. Very appropriate indeed because I am just about to start with Tony Ballance.

Dr Ballance: I am Tony Balance, the chief strategy and regulation officer for Cadent.

Chair: You must have met Mr Pawsey several times before. Very good. All is clear, open and above board.

Mike Foster: I'm Mike Foster, chief executive of the trade association Energy and Utilities Alliance and independent chair of the community interest company, Affordable Warmth Solutions.

Charlotte Lee: I am Charlotte Lee, chief executive of the Heat Pump Association.

Q166 **Chair:** I am aware that sometimes in this area of competing energies for heat in the future, things can get fractious and fraught, but I am sure that that will not be in evidence today and we will instead just be looking at the questions and being as academic as we possibly can.

Question one to the panel: how clear do you think the Government have been on the UK's technological pathway for domestic heat decarbonisation, and how should that evolve from now until 2050? I understand that you probably have different views, and they are to be welcomed. Tony Balance—or balance. I could not resist that, sorry.

Dr Ballance: The Government are reasonably clear. It is important to recognise that they are gathering the evidence together so that they can take a decision in relation to the role of hydrogen, for example, in domestic heating in 2026. Obviously, we are involved in the gathering of that evidence. It is really important that we keep the optionality there for heating in people's homes, because it is going to be incredibly difficult to see a world where we can decarbonise everybody through electrification, for example. Heat pump technology and heat networks are very good technologies that we should seek to accelerate into people's homes, but having that option of hydrogen in the home is super important. The



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Government are clear that they need to gather that evidence and take an informed decision in 2026.

Chair: You may or may not know that some of us on the Committee went to Levenmouth in Fife quite recently to visit the hydrogen prototype, or experiment, whatever you might want to call it, for 300 homes. Mike Foster?

Mike Foster: If you had asked me that question a couple of years ago, Chair, I would have said there was a very clear narrative and a pathway that the Government had identified, along the lines of all three options of heat pumps, heat networks and hydrogen boilers being the process by which Government envisaged decarbonising homes. The journey would have been something like heat pumps for new build to start with; at the same time, you could start rolling out hydrogen-ready boilers; blend hydrogen up to 20% into the gas distribution networks; upskill installers so that they are available to fit heat pumps and gas boilers and hydrogen boilers; all with a view to a 2026 decision about the long-term future of the gas networks as Tony just described.

Q167 **Chair:** Do you feel that is still on target?

Mike Foster: There is still a pathway, but it has been somewhat muddled over the last couple of years in terms of signals that have been sent by Government going forward. If we look at the recent Rishi Sunak reset, from our point of view he made absolutely the correct decision to say it is unfair to ask those people who are off the gas grid to decarbonise their homes by 2026 compared with those on the gas grid by 2035, and we welcome the acknowledgement that not all homes are suitable for heat pumps. That makes it a little clearer on the one hand, but for those people who have been investing in heat pump technology, it may have sent a slightly different message.

Q168 **Chair:** Charlotte Lee, we have heard two answers: reasonably clear and a little muddled. What is your own take on the situation?

Charlotte Lee: The Government's stance on waiting to collect the evidence to 2026 on hydrogen is always going to leave some ambiguity in the space, which is where the muddying and the lack of clarity comes in.

Q169 **Chair:** Is that too long a period?

Charlotte Lee: That is not for me to say. That is what they are working on in order to gather the evidence they need, and they feel they need that time in order to make sure they are making the right decision in that area.

With regard to heat pumps, we have heard a number of times, and it has been reiterated over the past three to four years, that 600,000 heat pumps installed by 2028 is the ambition. That is the figure that keeps coming out of Government in terms of their plan, but as we have just heard, some recent signals have clouded that ambition and sent perhaps



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mixed messaging to investors and people operating in this space, which is unhelpful in terms of their transition and their ramping up to deliver against that ambition.

Q170 Chair: You mentioned signals there and what have you. How effectively do the current market and policy signals direct consumers, manufacturers and installers toward low carbon technologies over the probable possible alternatives?

Charlotte Lee: The biggest one that we are really asking Government to act on now is the price signal of electricity relative to gas. That is really important in consumer messaging and behaviour, and encouraging demand for heat pumps and other electrification of heat technologies. Currently the price of electricity relative to gas is four to one, and that is not supporting rollout. The messaging to consumers of, "We need to move to low carbon technologies," is not supported by price signals in the electricity market to underpin that.

Government have committed to consult on rebalancing the levies that are put on electricity and gas in a bid to reduce the price of electricity relative to gas before the end of the financial year 2023-24, but that was promised early this year and we are still awaiting that consultation. We are very minded that consultations take time, but action takes more time, so we really need to be moving much more quickly to reduce the price of electricity to support consumers' decision making and make it a financially viable option.

Q171 Chair: Tony Ballance, do you have any comment on that ratio of gas to electricity prices?

Dr Ballance: Yes, I have two things to say. The first is about the need to rebalance some of those costs: this is a very tricky issue, so you can see why Government are taking their time. If more people come off the gas network and you move that subsidy from electricity on to gas, you penalise the people who are unable to get off the gas system, so it could be quite regressive in the way that it works. The fewer people there are on the gas network, the higher their bills and the more the policy costs get put on those people who cannot afford to switch to a heat pump or switch to an EV, or those kinds of things.

The other thing is that some of the reasoning behind the way in which electricity and gas pricing work is hugely complicated. There is an economic rationale for that, and the Government have committed to consulting on the market arrangements, but decoupling the gas market from the electricity market is extremely difficult, particularly in a world where, while you will have an awful lot of renewable energy driving the electricity price, at the end of the day you do need some form of gas therm power that sits behind that. Whether it is methane or whether it is hydrogen that is running the backup power source, there is always going to be an interconnection between gas prices and electricity prices. That



differential may close, but there is likely to be some differential between those two prices going forward for that reason.

Q172 **Chair:** Mike Foster, do you have a comment on those ratios and the role of central Government, local government and the market in that mix in determining the technologies to be taken forward?

Mike Foster: On the electricity spark gap, as it is referred to, some costs placed on electricity bills at the moment are frankly social policy costs and would be better served if they came from general taxation rather than on to consumers' bills.

Q173 **Chair:** What kind of costs?

Mike Foster: There will be things around ECO and some installation schemes, for example. That is much better done on general taxation. It is a fairer way of doing it, quite frankly, and it would address some issues around the rebalancing of costs that Charlotte alluded to.

If the argument goes a little step further and says, "Let's take those social policy costs and put them on to the gas network, on to gas charges, because then only 85% of consumers will be paying the burden rather than 100% of consumers," there is a real risk of locking in the fuel poverty angle that Tony alluded to for those people who rely on gas. Quite frankly, the only people who are can afford to buy heat pumps at the moment are those who are relatively well off, and if they are going to get a more generous, lower electricity cost on the back of those people who cannot afford a heat pump paying more on their gas bills, that is not a very progressive way of structuring bills in the UK.

Chair: I am tempted to do a Harry Truman here and ask, but on the other hand, Charlotte, what is your reaction to what you have heard?

Charlotte Lee: The point Mike Foster makes around the cost of heat pumps is a valid one in terms of the up-front cost. However, with the grant increase that the Government have issued on the boiler upgrade scheme, we have seen a lot of innovative market reaction to that, to offer heat pump installations at a very low cost—lower than gas boilers in some cases. As the demand and supply grows for heat pumps, we will see the cost of them reducing, so they will not just be for those who can afford to pay for the systems; they will be a cost-effective alternative to replacing their existing heat source.

It is also important to note that we are seeing more heat pumps being installed through things like the Energy Company Obligation for those in fuel poverty than through the boiler upgrade scheme at the moment. The schemes that are available to support those on low incomes are really galvanising the sector and accelerating heat pump deployment for those most in need.

Chair: I will move over to Mark Pawsey.



Q174 Mark Pawsey: I want to ask some questions about the role of consumers in this change. I think all our witnesses would agree that decarbonisation should be something that consumers are engaged with rather than something that is being done to them. On transport, people are well aware that EVs are on their way; they have friends who drive them, and there are lots of adverts for them on TV. How engaged are consumers with the change that is about to happen on domestic heating? Perhaps I might start with Tony Ballance because I know that, on hydrogen, Cadent have been involved in some proposals for people to try the product with mixed results.

Dr Ballance: Generally speaking, awareness among customers of the impact their heating system has on carbon emissions is quite low, so people have not made that connection in many regards. In any segmentation of society, there are, of course, a good chunk of people who are aware and are passionate about decarbonising their home and will be the early adopters of heat pump technology and the like.

I think you might have been referring to the hydrogen trial that is proposed in Redcar in the north east of the country, which is being run by Northern Gas Networks. That is part of the Government's programme of taking that decision in 2026. Some of you have been up to Scotland to see the first of those trials; the next is a village trial. That has raised issues around choice, but some of that is around the desire to have a choice of the heating system going forward. You are confronting people with stepping out of the usual cycle of replacing their boiler, which typically they do when it breaks down, rather than lots of people going into the market necessarily to change their heating system. To some extent that has piqued people's interest in technology.

Some people in those trial areas were perhaps not aware of this because, in some sense, they are reflective of the general population. One of the features of the trial that has come about is the desire for choice—taking a choice away from people by saying you must have a new heating system—so part of the offer that Northern Gas Networks have put in front of customers is not only having the ability to have a hydrogen boiler installed and supplied with hydrogen, but also the option of having a heat pump. It is about taking people with you on that journey and informing and educating them on the choices that are there. But as I said at the start of my answer, that awareness of low carbon heating technology is perhaps not there, and the impact that people's current heating system has on carbon emissions is not there.

Q175 Mark Pawsey: Mike Foster, how engaged do you think consumers are in the change that is about to happen?

Mike Foster: The good news for the Government is that when we polled consumers on this, overwhelmingly they support the drive towards net zero: three quarters plus of consumers we asked said they see it as important to them personally. When we asked them, "How much are you prepared to pay to do that in your home?" that is when it fell off a cliff,



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because people are either not in a position to, or do not want to, spend money on making those decarbonised choices.

That is why it was important, as part of the Government's Hy4Heat trials, that the hydrogen-ready boiler concept was developed and that the manufacturers gave a commitment that that product, when it was retailed, would be the same price as a natural gas boiler, so that there was a no-regrets option for rolling that out into people's homes. Whether they eventually use hydrogen or not, it will burn on natural gas now and could be, at some point in the future, converted to run on hydrogen but at no extra cost for the decarbonisation. That is the secret to taking consumers with you on the journey: no disruption and no up-front cost, or minimal up-front costs.

Q176 **Mark Pawsey:** So people have the right values and they want to do the right thing, but the cost is really putting people off even finding out more about it?

Mike Foster: The cost is a huge deterrent. Perhaps we should not be surprised that people are mindful, given the economic environment that we are living in. When you look at household savings, the median is just over £2,000, and a third of people have no savings at all. It is very difficult to have a conversation with people like that to say, "You should really be investing in a decarbonised heating system in your home." If you have that conversation, I can pretty much guarantee what the answer will be. That is why it is so important to make sure that the options that are given to consumers minimise those up-front costs and deliver the least disruptive way of converting from a carbon-emitting heating system to one that is decarbonised.

Q177 **Mark Pawsey:** Charlotte, do you agree that consumers would like to do the right thing, but they are put off by the potential cost of effecting change?

Charlotte Lee: Absolutely. Consumers do want to do the right thing, and climate change and the temperatures that we are seeing in this country, for example, really hit home the impact of the emissions that we are all releasing in our day-to-day lives. It is important to note that heating is fundamentally a policy-driven market and, for most consumers, the choice they make is based on ease, familiarity, and cost, as Mr Foster said. It is not an aspirational purchase, it is a functional one, and I really think that, as a sector, we need to make it as easy and as cost-effective as possible for them to make that switch.

Q178 **Mark Pawsey:** The Government have to set that policy, so is that Government then telling consumers what they have to do?

Charlotte Lee: If we look historically at how the heating in homes has been delivered, Government have had a key role in many of those step changes that we have seen—for example, central heating in properties moving from town gas to natural gas. It is important to note that it was a publicly owned company at that time and a large proportion of the



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buildings were publicly owned, whereas now we have moved to a much more private structure with different companies that we need to get on board and aligned, but also among the housing stock with the consumers.

It is important that people do feel like they have a choice. Nobody wants to force somebody to do something, and especially not a Government, but the choice cannot be to do nothing. That is the bit we need to get to and discuss with the consumers. We need to say, "The impact of heating emissions in homes is 14% of the country's total carbon emissions. Doing nothing is not an option," and then, as an industry and as a Government, we need to say, "But the options could include," and we set those out.

Without pre-empting a further question, that is where a regional approach may have a role to play here in setting out to consumers in a certain area what their choices are, depending on whether it is suitable for a hydrogen conversion or whether it is suitable for electrification. That will be based on an assessment of the network infrastructure, the layout of the town, and so on, but it will be done at the local level and will enable much more constructive, focused communication to the consumers in that space.

Q179 **Mark Pawsey:** Dr Ballance, how would your proposals to introduce hydrogen into the network cause consumers less disruption, less change from what they are already used to?

Dr Ballance: Mr Foster touched on this: the ability to have hydrogen-ready boilers installed gives a lot of customers that option down the track. As a country, we install 1.4 million boilers or so every year: if they were hydrogen-ready, you would have 14 million properties ready to be able to have hydrogen within a 10-year period. It just seems a bit of a no-brainer to me that government policy should definitely nudge in that direction of mandating hydrogen-ready boilers to give us that option.

As Charlotte said, however, we do need to give people options between hydrogen and electrification. I concur with her that the regional approach is best because options will differ from one region to another in terms of what the right technology might be for certain regions with different housing stocks, the availability of hydrogen and the ability to convert that particular network to upgrade for electrification. They are all factors that require something that happens at a sub-national level and at the regional level where those issues can be communicated.

Chair: I know the Government have already made interventions in this, with the Clean Air Act taking the choice of coal away from some people in towns, but that is just as small aside.

Mark Garnier: Charlotte, I would like to ask a very quick question. There seems to be an argument coming back about the cost of heat pumps and the cost of all the stuff that goes into them. Take as a hypothetical example a house with a family living in it who have a brand new Range



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Rover parked outside and they cannot afford a heat pump. They can afford a Range Rover because the manufacturers have come up with the financing packages so, effectively, you are buying your car by the mile. It appears that the financing for the whole renewable sector seems to be very immature, and I am wondering anybody is really having conversations about this? Are banks coming up with ideas? Because ultimately what you want to do is have a system whereby the cost of this goes into your monthly bills.

Charlotte Lee: Absolutely. You may have seen recently that a Swedish-based company has just launched a proposition in the UK for leasing heat pumps, so it will be a finance option; you do not pay up front for your heating system, and I expect we will see much more in that space. In Scotland, for example, they provide 0% finance loans: they provide a £7,500 grant for a heat pump, and then an additional £7,500 that you can get on a 0% interest loan to support the remaining cost. That is something we are talking to the UK Government about rolling out across the country.

Chair: Good points, well made. Lloyd Russell-Moyle?

Q180 **Lloyd Russell-Moyle:** Is the Government's target of 600,000 heat pump installations per year by 2028 achievable and realistic? If it is, what is needed to achieve it?

Charlotte Lee: That is a really good question and one that keeps coming up. The setting of the ambition and continuing to reiterate that ambition is helpful for the sector in terms of having something to aim for. That 600,000 is broken down into 200,000 installations in new build, and 400,000 in the retrofit sector. The 200,000 in new build is assumed to be driven through the Future Homes Standard, and we are awaiting that technical consultation imminently, which is set to be introduced by 2025. It is really important that that consultation and the changes to the building regulations in light of the Future Homes Standard consultation do come in 2025, in order to support the 200,000 installs in the new build sector by 2028.

In terms of the 400,000 in the retrofit sector, we are currently running at about 60,000 a year, so that does require a significant step change over the next five years.

Q181 **Lloyd Russell-Moyle:** We are already at capacity, are we not, of what we can install?

Charlotte Lee: That is not the understanding that I have.

Q182 **Lloyd Russell-Moyle:** I have a home that is eligible for an ECO4 grant. I have gone through all the companies of ECO4 and not one of them will service my house with a heat pump because they say they do not have any engineers to be able to put it in for the next year. I have literally gone through every single one of them and said, "We are desperate for this, as is the house that is next door to me," and it will not work. There



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is a real problem that consumers cannot connect with installers.

Charlotte Lee: The installer supply chain is a really interesting factor in all this, and we have seen significant growth in the number of individuals trained to install heat pumps over the last year. It has trebled from 2022, and the data that I have collected shows up until the end of quarter three this year, so we are missing a quarter, but we have 9,000 qualified individuals capable of installing heat pumps across the country.

Q183 **Lloyd Russell-Moyle:** How many heat pumps would those 9,000 be able to install in a year?

Charlotte Lee: Our figures show we would need 36,500 by 2028, and that would enable them to do one every three weeks individually, but they would work in teams.

Q184 **Lloyd Russell-Moyle:** So 36,000, and what is the rate of adding to that 9,000 every year?

Charlotte Lee: If we continue to grow at the rate that we have seen this year, we will easily meet that 36,000 qualified individuals. The challenge we have in terms of tracking that and what they are doing is that, as opposed to Gas Safe, where you register individuals, heat pump installers are registered as businesses so it is difficult to know how many individuals are operating within a business; the industry is looking at how to better track that. But effectively, the lead time suggests that it is doable. Within our membership alone, we have the capacity to train 40,000 individuals a year. That is our membership. There is no lack of either training or training courses available, or of supply of the heat pumps themselves.

Q185 **Lloyd Russell-Moyle:** Is it that the government grants are not working with all suppliers and there is a problem at that end? Where is the problem? At the moment, ECO4 is available for anyone who is on benefits, effectively. So why is no one in the private rented sector on benefits getting ECO4 insulation and potential heat pumps? They physically cannot in Brighton at the moment. It may be different in other areas, but that is the area I represent.

Charlotte Lee: I think this is a supply and demand issue whereby the installers have perhaps been burned by the change of policy. We were looking at 2026 for phasing out fossil fuels off the gas grid, and that has been extended out to 2035 for the reasons that have been discussed, but it shifts the pattern down the road in terms of how quickly the installers that are currently installing fossil fuel heating systems will need to get retrained and re-skilled. If they have full order books and are delivering those installations and customers are not asking for different options, the question is, what do we need to do to stimulate them undertaking the training and moving across more quickly than perhaps they would normally?

Q186 **Lloyd Russell-Moyle:** There is some unease in the public about heat



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pumps. Let us not over-exaggerate it: not a huge amount but a bit, because there is talk that some properties might not be suitable—it is a very limited number, but some are not—and there is talk that they maybe do not heat your home as warm. What can we do to make the case that heat pumps are a viable alternative to gas or solid fuel or electric heating? Lots of houses have had electric heating for 30, 40 years, that is not new.

Charlotte Lee: That is a really good point, and we really need to get consumers on board and on track to considering the different options. I do not know about you, but one of the best recommendations I can get is from a neighbour who has had a really good heating system and it is still warming their home. We need to be demonstrating that 380,000 properties in the UK are currently being heated by heat pumps, and a massive proportion of those are very happy with their system. It is about getting positive messages about positive experiences out there.

Q187 **Lloyd Russell-Moyle:** Could there perhaps be something there to do with rewarding neighbours that have had heat pumps? Vicky talked about this a few times.

Chair: Go on, tell us this, Vicky, show and tell.

Vicky Ford: Show and tell.

Lloyd Russell-Moyle: It is done in other areas, such as art house open days and things like that. Is there a need maybe to say, “You get a small grant or a bit off your bill, or whatever, if you want to open up your house to show your neighbours how great it is”?

Charlotte Lee: Nesta are facilitating that exact functionality, but just going back to the consumer perspective, it is really important for consumer behaviour to make it financially viable for them to make this change. We will see a mindset and a change in demand when it becomes cheaper to heat your house with a heat pump as opposed to your current heating system.

Q188 **Lloyd Russell-Moyle:** I want to give some time to the other two witnesses and I have two minutes, so you have a minute or so each. Tony, do you want to go first?

Dr Ballance: The target is hugely ambitious but that is not to say it is the wrong target. Charlotte talked about the 200,000 installations for new builds which, to me, again, seems one of those obvious things where you have well insulated homes and a good technology that can work.

Lloyd Russell-Moyle: A no-brainer for every new build.

Dr Ballance: It is a no-brainer to do new properties. Where it gets tricky is for existing properties: you have the consumer angle in terms of cost and disruption, the installer angle which you have clearly articulated, and the capacity and the network angle which you touched on.



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Just to give a bit of context, it is not surprising that this is tricky because we have the worst insulated houses in the UK. We have a gas network in the UK which people rely on for their heating systems that is second to none in the world, because we designed our systems for primarily gas to supply that heating load to houses, not for the electricity system. That is why you are going to have some capacity issues.

I will just put one other thought in your mind. People often say, "Well, look what's happening in Europe. They're rolling out heat pumps, we're not." It is unfair to use some of those examples. In the Nordic countries, yes, there are lots of heat pumps, but guess what they are using to supplement their heating? They are burning wood through wood stoves. In southern Europe, you have a different system relying more on electrification. The one comparator is the Netherlands. Yes, their heat pump uptake is more than ours: they installed 110,000 last year, but only 40,000 in existing properties, and that is less than 1% of their housing stock.

Lloyd Russell-Moyle: They have a bigger communal heating system already.

Dr Ballance: They do, but I am just merely giving you the facts and figures that it is very difficult to say, "This is going to be easy." It is going to be extremely challenging to do for the reasons that I articulated.

Q189 **Lloyd Russell-Moyle:** But the difficulty with even hydrogen-accepting boilers is that they still produce NOx gases, they are still not great for the environment. You want the hydrogen cell technology in houses really. That is what we need to get to, not burning hydrogen. It is hugely expensive if you create hydrogen and then burn it.

Dr Ballance: The price of hydrogen is forecast to come down, much like the cost of offshore wind has come down—

Lloyd Russell-Moyle: The price of hydrogen will never be cheaper than the price of electricity.

Dr Ballance: You have to look at the whole system cost.

Lloyd Russell-Moyle: It will never be cheaper than electricity. No, it is a physical impossibility for it to be cheaper than electricity.

Chair: We will have to leave that debate hanging. I have to move on to Vicky Ford.

Q190 **Vicky Ford:** Charlotte, when we went to Fife, we were shown a slide that suggested that the gas network transfers four times more energy per day in the winter than the electricity network, and then you get the huge fluctuations on really cold days. If you have widespread electrification of heat, can the grid cope with a Beast from the East?

Charlotte Lee: I think that—



Vicky Ford: Yes or no?

Charlotte Lee: I would not be able to answer that question offhand, but I can write to you on it. The important point to note here on electrification and grid infrastructure upgrades is they are in train. Ofgem and the grid operators are very aware of the need to do so, regardless of whether heat pumps play a role. That is because of consumers' move to electrification, with electric vehicles as well as heat pumps.

Vicky Ford: You need to have an electricity grid that could cope with a Beast from the East, which is presumably massive extra supply, just in case.

Charlotte Lee: The Government have commissioned Mr Nick Winser to undertake a complete review on the transmission side of things, and the Secretary of State has accepted all his recommendations to support that transition aspect. Moving towards distribution as well, it is really important to make sure that the infrastructure is across the board.

Q191 **Vicky Ford:** Gentlemen, do either of you have a comment about this period of really cold days?

Mike Foster: If you converted all properties over to heat pumps tomorrow and have EVs, there is no way the current power grid would be able to cope with that surge in peak demand.

Q192 **Vicky Ford:** Even when we are looking at additional grid, which we clearly are?

Mike Foster: It is the peak heat requirements, the Beast from the East that you mentioned, that challenges everybody. The advantage of having a gas system, which Tony can probably allude to better than I can, is that you can line pack energy, you can store energy in the pipes, you can store energy in hydrogen storage under the ground. That gives you the ability to deal with those peak demands.

Q193 **Vicky Ford:** Tony, would you say you need both? Electrification and gas backup?

Dr Ballance: Absolutely. There is no scenario that does not have some therm capacity in terms of gas, either through hydrogen, or methane, or carbon capture and storage that is backing up the system. In some sense it is a bit more acute, because on a peak winter's day it could be 10 times that load through the gas grid. You are going to need a lot of capacity in the electricity grid. The numbers are something like two or three times as much capacity, bearing in mind that heat pumps have that efficiency property. The numbers on that are upwards of £350 billion to construct a grid of that size. We have a real issue: do we need a grid that is two times or three times as big, depending on what load you have? These are huge challenges for the infrastructure of the UK, to be able to cope with that peak heat demand on a cold winter's day when the wind is not blowing. It is a huge issue.



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Q194 **Vicky Ford:** Charlotte, why do you think we are so far behind many other European countries in installation of heat pumps?

Charlotte Lee: It is very easy to compare with countries across the border, but when you delve into the figures that are being used in those spaces, a lot of the European countries are counting air-to-air heat pumps in their figures, whereas we in the UK are not. When I quoted 60,000 heat pump sales this year, that is of hydronic heat pump systems, so water-based units. We do not capture data on air-to-air units, which are very popular overseas. There are other things as well, in terms of the price of electricity relative to gas in many of these countries. France, for example, the price ratio is very—

Q195 **Vicky Ford:** You said four to one, electricity versus gas. Does that mean if I have a heat pump it costs four times more to heat my home?

Charlotte Lee: No, not necessarily. No, it would not.

Q196 **Vicky Ford:** Could you just clarify that so that we have that on record? Roughly what is the cost of heating my home, once I have the installation, on heat pump versus gas?

Charlotte Lee: It depends on the efficiency of performance of your heating system. We say that heat pumps are generally at least 300% efficient. If the price ratio of gas to electricity was three to one, it would be cost parity. But if your unit is operating at a 400% efficiency, whereby it is using one unit of electricity to produce four units of heat, which is that coefficient of performance ratio, then it would be cost neutral. But if your heat pump was operating at a coefficient of performance of 3.5, so 350%, there would potentially be a slight increase in your bills relative to gas.

Q197 **Vicky Ford:** Thank you for clarifying that. We have talked about the levies that we have on electricity, and whether you move them on to general tax or on to gas: you have already answered that question, good.

On energy performance certificates, we have heard lots of criticism that they do not clearly evaluate heat pumps. Could you give some further thoughts on that, Charlotte? What are the issues with EPCs?

Charlotte Lee: I listened to your questioning of the officials around the EPCs, and it is fair to say they are aware of the limitations and are looking at a home energy model to replace it. But to answer your question directly, in terms of the EPCs, they are currently largely based on a cost ratio. The price of electricity relative to gas means that, in some cases, installing a heat pump impacts that rating. It is driven by the cost largely, rather than the carbon emissions.

There are two aspects to an EPC: one that looks at cost and one that looks at the energy efficiency rating. It is the cost one that drives the headline letter, which is the impact. But EPCs are based on SAP, the standard assessment procedure, which is being updated in line with the Future Homes Standard. We are expecting SAP 11 to be published next



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year alongside the consultation, and we have been assured that the Government have taken steps to make sure that the benefits associated with the carbon emissions from heat pumps are relative.

Q198 **Vicky Ford:** You would say that the energy performance certificate is currently too cost-based and not enough carbon-based, and there needs to be a balance?

Charlotte Lee: Yes.

Q199 **Vicky Ford:** Gentlemen, do you agree?

Mike Foster: That is how the EPC is currently formulated. There are also problems with the EPC in terms of the quality of EPCs and the people that do those assessments. They are variable in quality, it is fair to say, and that poses a problem when government policy is determined pretty much around EPC values. I wonder if you could indulge me, by just answering one of the questions that—

Vicky Ford: I have run out of time, so we will come in at the end if you want to answer another question.

Chair: We will come back to that. I have to say, I have a heat pump myself. I had it for 11 years before it became a contentious issue I did not realise I was dealing with. It is an air source, but I am off-grid. I am going to Mark Pawsey now.

Q200 **Mark Pawsey:** Thank you. I have a couple of questions for Dr Ballance on hydrogen. Lloyd Russell-Moyle spoke about the challenge of getting an engineer to install his heat pump. Are we going to be faced with the same problem if we need to convert or install a whole new load of gas boilers?

Dr Ballance: No, the process would look something like this: if, as I said earlier, you were installing hydrogen-ready boilers now, which is a boiler that is virtually identical—Mr Foster might like to comment on this—to a methane boiler today, which is ready. You install it in the home, you can replace the existing boiler—

Q201 **Mark Pawsey:** Is the workforce ready to do that?

Dr Ballance: Yes, because in some sense, there is little training required in order to do that. In some sense, the gas fitters that we have, tens of thousands in the UK, need a little training to be able to go and install these gas boilers. The simple answer is, yes.

Install these over the course of the next few years. When it comes to a conversion of a street, we would obviously have to zone off areas where we are going to turn the gas off and put the hydrogen in. At that point you would need a plumber to go into someone's house and change literally two or three components in the boiler that is today burning methane and tomorrow burning hydrogen. It is as simple as that. I went to Worcester Bosch—Mike can talk more eloquently about this than me—and you can see the two or three parts you can hold in two hands that a



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plumber would need to go in and change. Compared with other technologies, it is a relatively straightforward thing. Obviously, there is a lot of stuff that goes on behind the scenes in doing that conversion but, for a consumer, they do not see much of that in that conversion process.

Q202 Mark Pawsey: From the consumer's point of view, one of the concerns that people expressed at Whitby, and we heard about a little at Fife, was the concern about the safety of hydrogen. How safe is hydrogen?

Dr Ballance: Yes, on that question, we need to stand back. The UK runs a world-class, very safe gas network, and has done that for the last 200 years. There is not a world in which a gas company like mine would want to do anything that was not intrinsically safe. We also have a world-class regulator in the Health and Safety Executive that oversees everything. They are looking at all these trials, gathering the data that has been provided—lots of information, analysis, data have been collected over the past two years. Mike mentioned this Hy4Heat programme, looking at heating in the home, and there has been work on the network.

You can go up to Spadeadam in Cumbria, where they have done the testing in the home. They have two homes, they have put methane in there, they have put holes in the pipes, they have seen how hydrogen behaves in those circumstances. What the results show is that hydrogen is at least as safe as methane is today, with the right safety measures put in place. The HSE are looking at that information that has been gathered over the last few years, and they have to approve that information to decree that it is safe. But the evidence is there that shows that hydrogen is as safe as methane in the home.

Q203 Mark Pawsey: Mike Foster, are you comfortable with Dr Ballance's assertion about safety?

Mike Foster: Absolutely. On the issue of hydrogen training for installers that you raised, Mr Pawsey, there are 130,000 Gas Safe-registered engineers. They must have their accreditation updated once every five years. It would take one extra day of training for them to be deemed safe to work on hydrogen appliances. Effectively, in five years the whole of the Gas Safe workforce could be brought up to speed with dealing with hydrogen technology.

What would happen with the appliances themselves is that the manufacturers would offer training at their own bases on their own products, so there would be familiarisation with the products, just as they do now if they offer up a new range.

On the safety side, the Hy4Heat trial was very clear in terms of its conclusion. The Health and Safety Executive authorised a letter to the department to say they were happy with the conclusion that a hydrogen boiler in the home for cooking and heating can be made as safe as natural gas. That is the reassurance that consumers need to hear.

Q204 Mark Pawsey: Charlotte, are you comfortable with those assertions?



Charlotte Lee: I cannot comment on the safety of hydrogen. One thing it is useful to put on record is we have heard a lot about hydrogen-ready, but it is not available yet. Heat pumps are. Any deployment of heat pumps currently will not negate a future need for hydrogen or the decision in 2026, but it is really important that they are here, now, and they are reducing carbon emissions. We need to be supporting that technology as well as looking at the alternative options.

Q205 **Mark Pawsey:** Mike Foster, we have seen the Government put back some target dates—on EVs, for example. Government are intending to make a decision on hydrogen in 2026. Do you think that is likely to happen? Is there a danger that that decision might be put back?

Mike Foster: There is always a danger that decisions like that will be put back because they are big decisions to make. In terms of the Prime Minister's reset and the acknowledgement that 20% of homes would be exempt from switching to a heat pump, this probably leads you to the conclusion that there is going to be large-scale need for hydrogen in people's homes. What that 20% exemption is, we have not yet been able to narrow down and define from Government. The closest we have is that it is those properties with expensive solid wall installation that is required. What is defined by expensive is a bit vague and not a particularly objective measure.

If you were to look at all homes with solid wall, then you are looking at something like 8 million homes, nearly 40% of the housing stock. Therefore, you can lead to an obvious conclusion that there is going to be a requirement for a gas-based network. It is then the question of, "What gas are you going to allow into that network?" If you are going to meet the net zero targets, then your choices are limited to bio-methane and hydrogen, and hydrogen is the one that can be produced in volume.

Q206 **Mark Pawsey:** You are acknowledging that there is a future for the gas network in some form or other, but it is not impossible that the decision could go the other way. What would be the consequences of us deciding not to use the gas network that we have created over the last 100 years or whatever it is?

Mike Foster: First, there will be real challenges in terms of social policy, in terms of people's ability to afford to pay for the alternatives. Under the boiler upgrade scheme, the average cost of having a heat pump installed is something like just over £13,000. Even with a grant, it is still a considerable up-front sum, and, as I said before, people do not have the savings available to pay for that. I have not seen any indication from Government or opposition that they are going to pay for people to have heat pumps installed.

If you then start having the clock run down on the gas network, there is a question mark about the decommissioning of the gas network—how that is done safely, and who pays, because it would be perverse for the last person left on the network to pay the whole of the decommissioning cost.



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Nobody has said how that decommissioning cost is going to be borne. Frankly, as you start reducing the number of users on the gas network, the fixed costs of running the network are going to be laid on to people who are not able to switch away from it. I mentioned the affordability of a heat pump as an alternative; it is going to be the least well-off in our communities that have to bear the cost of their ordinary gas bill, and then an additional fixed-cost element to pay for those people who have been able to move away from the gas network. There is a double whammy there, let alone what might happen in terms of the decommissioning costs.

Q207 **Chair:** Thank you very much. We do have a wee bit of time at the moment, so Mr Foster, we can hear your answer to the question from Lloyd Russell-Moyer.

Mike Foster: Thank you for indulging me, Chair. A straight answer to a straight question. No, the 600,000 will not be met. It might be fine for new build, the 200,000 element that both Charlotte and Tony mentioned. That might be okay, but it depends upon house building numbers. It is out of the control of Government, really. In terms of the number remaining on retrofit, the Prime Minister's reset has already suggested that something in the region of 80,000 units of heat pumps that would have been fitted post 2026 will no longer be fitted into people's homes. That is oil and LPG. The increase in the boiler upgrade scheme subsidy to £7,500 has reduced the number of units that can be subsidised by 10,000. That is why those numbers will not be met. Even if the trend was suggesting that it was on an upward trajectory to meet it, it is not, and that is going to be a difficult one.

You mentioned the price of hydrogen, and how it could not be similar. Yes, it will be lower than electricity. There have been studies done. It is not necessarily about the efficiency of converting an electron to a molecule; it is the cost of doing so and the cost of getting that molecule into people's homes. That is what the currency should be in the discussion. Work done by the Energy Networks Association suggests that the retail price of green hydrogen into people's homes will be about 6p a kilowatt.

Q208 **Mark Garnier:** I want to pick up on exactly this point. To produce hydrogen, you need to have an electricity input, therefore it will be the lowest electricity input, or cost of electricity. But how can it be cheaper to produce hydrogen than it can be to produce electricity? The physics does not add up.

Dr Ballance: It is not about physics; this is about economics.

Mark Garnier: Both do not add up.

Dr Ballance: Both are important, but people conflate the two. Yes, heat pumps can be four times more efficient than a hydrogen boiler. The



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problem is the cost of the heat pump is £10,000 more than the replacement hydrogen.

Mark Garnier: I get all that, but the—

Dr Ballance: This is important. You have the cost of the heat pump, which is more. You have the cost of the back-up generation that you need when the wind is not blowing on a cold winter's day, when you need 10 times more power into the system. You have to upgrade the system. You need to put in all that whole systems thinking, all those costs, to compare like for like. The physics do not give you the same answer as the economics.

Q209 **Mark Garnier:** There is another important physics question on this, which is when I have spoken to both physicists and chemists, professors, they point out that the hydrogen molecule is a tiny little molecule. The gas distribution network, which has been in existence for a long time, is handling methane, which is a much bigger molecule. The problem is that it is very unpredictable what will happen when you start putting hydrogen into the existing network, and you will end up with it bleeding through the walls of the pipes.

Dr Ballance: That is simply not true, if I put it straight. Part of your question said, "Because we have had this gas network for a long time." By the time we get into the 2030s, 90%-plus of the network will have been replaced with plastic pipe, which is perfectly adequate for distributing hydrogen through those pipes.

Q210 **Mark Garnier:** How much is that costing? An entire gas network.

Dr Ballance: That is a cost that is being borne today, because we have been doing that investment programme for the past 20 years, and we have another 10 years to complete of that programme. That needs to be done, because that has been mandated by the Health and Safety Executive to ensure that within 30 yards of a property the gas has—

Mark Garnier: It is a big job.

Dr Ballance: It is a big job, but as I say, we have been doing it for 20 years.

Q211 **Mark Garnier:** And everybody is confident that these plastic pipes are not leaky for hydrogen molecules?

Dr Ballance: Yes, the testing that I referred to earlier has shown that they are not leaky, and they are safe.

Q212 **Mark Garnier:** The other question I wanted to ask about hydrogen is one of the suggestions that I have heard in some projects that are coming through, which is a wind farm in the Falkland Islands. You have a very nice constant wind at 10 metres per second, I believe it is, so it is very, very predictable. You have a lot of wind there, so you can produce a lot of electricity, and I think the potential there is to put up 2,000 turbines.



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The problem is it is miles from anywhere. The suggestion is to convert all that electricity into green hydrogen, and then you can ship it around the world like LPG dissolved into ammonia, if I remember rightly, and then use it. Is that a viable proposition? Does hydrogen have a future as being a form of energy that you can convert one form into that, so you can ship it, and then convert it back into whatever form of energy you want to afterwards?

Dr Ballance: Absolutely. You put your finger on it: the ability to convert electricity in one place into a storable product that can be shipped around the world in whatever form. Coming closer to home, you can imagine a European market for hydrogen existing. The issue that we have in the UK is creating that hydrogen economy. I am not talking about hydrogen for heating, I am talking about in the first instance for industry and power and getting that under way such that we can participate in that market. Hydrogen will be a very valuable product because of its characteristics, such as the ability to burn the product like gas today. You also have those processes that require high heating as part of the process. We need to get behind the whole thing of creating that hydrogen economy in the UK.

Mike Foster: That is very much the thinking that is going on in the EU currently, where they are looking at the Sahara to generate electricity through green hydrogen and using pipes into Western Europe as a way to do it. In Australia, they are looking at their port facilities to export into China and Japan for hydrogen. The US are used to exporting gas recently, and they can see a route to export their surplus hydrogen produced over to the UK and deposit it at Milford Haven, and from there into the gas network that everybody has quite rightly suggested is world-leading and has enabled us to keep the lights on in western Europe over the last few years, post Putin's invasion of Ukraine.

Q213 **Mark Garnier:** Thank you, that is very helpful. Tony, can I just get back to you? Mark started talking about the gas fitters. You referred to them as plumbers, you probably meant gas fitters rather than plumbers.

Dr Ballance: Yes.

Q214 **Mark Garnier:** What conversations have you had with the regulators? Because the one regulated part of the construction industry is the gas fitting part of it, CORGI, if I remember rightly, is a regulator. What conversations have you had with them about making sure that gas fitters are going to be properly regulated, and how they go about regulating hydrogen gas fitters as opposed to methane gas fitters?

Dr Ballance: If I may, I will defer to Mike.

Mike Foster: That is part of that five-yearly retraining that all Gas Safe-registered engineers do. It has moved on from CORGI to Gas Safe now. As part of their normal routine, they have to have a refresher. You are quite right; it is regulated that way. It is one day of extra training that is



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required as part of that cycle every five years, so it is easily manageable to deliver.

Charlotte Lee: If I may, that same cycle can also be used to stimulate the growth of the heat pump installer supply chain too, which will largely come from existing heating engineers, but it is not a day; it is more like three days, as there is a greater competency and qualification training need to move to a heat pump installer. However, it is three days, not three weeks. Over the course of five years, that 130,000 installer base can also be repurposed to install heat pumps too, very effectively.

Q215 **Mark Garnier:** It sounds like you all are very confident that this training stuff is moving forward in the right way. I just wanted to ask one last question, about a hydrogen-ready boiler mandate. Is this something that the Government should introduce so that any new boilers being manufactured, rather like internal combustion engine cars, are now mandated to be easily convertible?

Mike Foster: Yes. It is a decision that should have been made years ago. It was highlighted back in 2010, and we waited three years for a consultation on it. We are still awaiting the outcome for that consultation. The blunt answer is yes, because the manufacturers are giving the assurance that there is no extra cost to the consumer in having a hydrogen-ready boiler fitted into their home, compared with a natural gas boiler. It is a zero-regrets option that just keeps the door open for whatever choice the consumer might want to make in the way in which they heat their homes going forward, be it a heat pump, or a heat network, or converting to a hydrogen boiler, it is done.

In terms of the conversion process, the industry reckons we can convert a gas boiler from natural gas to hydrogen in under 20 minutes. The Government, as part of their definition, have said two hours. There is plenty of scope and, as Tony said, it is three parts.

Q216 **Mark Garnier:** I am not picking on Worcester Bosch, but you obviously know Worcester Bosch very well because it was in your constituency. Is there an incentive for someone like Worcester Bosch to produce boilers now that are non-convertible, because they know that at some point they will have to sell another boiler that is convertible? Is there a mismatched economic incentive on this?

Mike Foster: There are mismatches in the signals that Government have sent to industry, that is quite right. They want industry and encourage industry to develop the hydrogen-ready boiler as a way of going forward, with a view to 2026 being that ultimate decision. Industry is also grappling with other policies such as the clean heat market mechanism, which will penalise places like Worcester Bosch for making and selling those hydrogen-ready boilers. It is those perverse things that are going on at the moment. This is why I mentioned at the outset that a clear pathway going forward is now starting to get a little murky, to the



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detriment of both British industry and ultimately to a route to decarbonise people's homes, which is the key to all this.

Q217 **Mark Garnier:** The message to Government is, "Must try harder"?

Mike Foster: It is to be clear and stop penalising British industry for trying to do the right thing.

Chair: Thank you. Vicky, I am going to indulge you for one minute.

Q218 **Vicky Ford:** The problem is that in Whitby and Redcar people said, "No," when they needed to have 100% of people convert from existing methane on to hydrogen. This may be a bit bonkers, but in the east of England 20% of households—one in five—are off-grid. Why have you not looked at local hydrogen solutions in some off-grid larger villages, to give people a choice between hydrogen or my dodgy oil that continues to run out on Christmas Eve, and suddenly I am freezing cold? Why have we not looked at hydrogenising some off-grid communities?

Dr Ballance: It is a jolly good idea, if I might say so. We are in that process that is decreed by the Government, the network trial, and the village trial was conceived a while ago. That is the thing that is in front of us that ultimately Government will need to take the decision on. While that is there, that is critical to providing that evidence.

Q219 **Vicky Ford:** Can I respectfully suggest that you look at some areas that are off-grid, close to excess wind power, and give them the option? Because it seemed to us, from what we learned in Fife, that household choice was really important.

Chair: I will have to leave that one hanging. I am very sorry, I can see Mike is desperate to say something. Ten seconds, Mike.

Mike Foster: There is a website called non Non-gas Map, which is very useful to look at to see how close properties actually are to gas pipes but are not connected to the gas grid. It is a really good point that you make.

Chair: That is it, thank you. I am going to bring this to a close, but I just note, one of the main objections I thought to heat pumps—I said I have had one for 11 years, but I have had one for 14 years—is the up-front costs and the financing, which Mr Garnier touched on. Tony Ballance, you said that the worst of it is the up-front costs, and if that is spread over in financing, that changes quite a lot of it. I also note that when people have gas, they are quite relaxed about insulation because gas can be dispatched so quickly, and they are wasting a lot, but the heat pump is a bit slower, they make sure they insulate their homes a bit more. There is a behaviour interplaying with the technology, or interplaying with the heat, or what have you. I have to end it there. I would like to discuss this an awful lot more, but thank you all. We will have a short pause before we have the next panel in front of us.

Examination of witnesses

Witnesses: Professor Nick Eyre, Jody Pittaway and George Webb.

Q220 **Chair:** Welcome back to the Energy Security and Net Zero Committee and the second part of the second session of our heating our homes inquiry, looking at technology and innovation. We have a very welcome and distinguished panel of witnesses. Starting on my left: name, rank and serial number, please?

Professor Eyre: I am Nick Eyre, director of the Centre for Research into Energy Demand Solutions and professor of Energy and Climate Policy at the Environmental Change Institute of the University of Oxford.

Jody Pittaway: I am Jody Pittaway, the sector director for SSE's Heat Networks business.

George Webb: And I am George Webb, CEO of Liquid Gas UK.

Q221 **Chair:** Welcome, and thanks for your time in coming here.

I will start with George Webb. Have the Government been clear enough on their timescales for phasing out fossil fuel heating, both on and off the gas grid? Obviously, there is kerosene in certain places, for instance, where I am from.

George Webb: I will look at off-grid because that is the sector where we operate. We have had a very difficult period with gas boilers being phased out by 2026, which sent a message to consumers in the off-grid market and did not give them enough time to look at other options. Those options are quite expensive as the technology has probably not progressed enough to be a solution.

The Prime Minister announced a more pragmatic approach a few weeks ago, giving an extension to off-grid customers living in rural areas such as in Scotland and Wales, where housing stock is a lot older than that on the mains gas grid and insulation is not at its best. That extension has given those rural off-grid consumers the opportunity to look at a more mixed technology approach.

In the off-grid sector where a heat pump is suitable, that is great, those sorts of solutions are fine, but it also gives us time as an industry to develop renewable liquid gas and bring it to the market, working with Government to be part of the solution for a mixed technology approach.

Q222 **Chair:** There is going to come a time when fossil fuels might run out. As we saw with the Ukraine war, there might be spikes, there might be shortages going forward. At some point, there will probably have to be a change away from them anyway, will there not?

George Webb: Yes, and we accept there will be a change. We are all working towards 2050 and the net zero date, but there has not been a lot of clarity on that end date. What we need now is policy clarity so that investment flows to produce those renewable liquid gases and consumers can have a choice. It is all about consumer choice, particularly in the off-



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grid market. What solution do they want to spend their money on? We have heard in previous panels that times are hard regarding finances. A lot of off-grid consumers are asset-rich, but cash-poor. You also have to remember that off-grid is not just about housing stock; there are a lot of people who live in mobile homes and they also need heating.

Q223 Chair: Professor Eyre, what levers or prompts do you think can be employed to encourage people to voluntarily switch away from fossil fuels before a deadline is enforced? Where is the carrot?

Professor Eyre: That is a good way of putting it. We heard a lot in the last session about supply chain issues, and clearly, when the structure of the market is changing quickly, it is an ongoing challenge to keep demand and supply roughly in balance. Although it was not said in the last session, people will not train if there is no work at the end of the training, so that needs to be done.

A combination of sticks and carrots is needed or sticks, carrots, and tambourines, as one of my former colleagues put it.

Q224 Chair: What would the tambourine be?

Professor Eyre: It means telling people, communicating well with people.

Chair: A fanfare around the issues.

Professor Eyre: Yes, but not just promotion: open house days, as was talked about in the last session, and using friends and family as trusted sources of information.

Chair: Show and tell, as Vicky Ford often says.

Professor Eyre: Yes, and I have helped do that around colleagues' homes that have been retrofitted. It can be very successful, though probably only for a niche of potential consumers.

After that, it is a combination of incentives. How those are done is obviously a matter of political choice. We have the Boiler Upgrade Scheme at the moment, and that is going up in value, but at the end of the day that certainty that at some end date, as a homeowner or landlord, you will have to have done something also helps reduce the level of incentives that are needed. Not for the poorest households, perhaps, but for people who can pay the sense that "I'm going to have to do this eventually" is quite important.

Q225 Chair: Thank you. Jody Pittaway, I have about a minute for you to give your reflections.

Jody Pittaway: To echo the comments that we have heard here, it is equally important to have clear messaging around boiler phase-out. Some messaging is around domestic, but we would like to hear strong messaging around commercial, larger scale gas boilers as well. That



would help to underpin the conversations that we are having with prospective customers for heat networks, by providing a timeline and a route map up to the point at which their gas heating systems will be required to be removed, and changing those thought processes which are now very much, "I have gas for the foreseeable future. I'm looking to replace current gas with more gas." To be able to change that narrative, and confidently point to route maps that see an end where that is not possible will help underpin our conversations about why a change to a heat network makes sense now.

Q226 Mark Garnier: I wanted to talk about the process in terms of the decarbonisation of off-grid homes and look at what technologies are available to get us there. Obviously, you cannot get all the way in one go. George, if I can start with you, are the Government being properly clear on setting out a technological pathway for decarbonising off-grid homes? Do you know what the Government want?

George Webb: There is probably a bigger story. Off-grid homes have been seen as low-hanging fruit and the poor relation to the mains gas network; that was told out by the 2026 date, which is similar to the date set for the phase out of natural gas. That is the first point I would like to get across. Off-grid is on the pathway to a renewable future. We have spent over £600 million over the last few years, £260 million of which has gone into producing renewable liquid gases. The industry is confident that we have a solution, but we have not had any policy clarity of what that means going forward.

Part of that money has been spent on producing renewable liquid gases that will be coming online at a trial plant in the Midlands in January, where we will be doing live trials next year. Another plant is going to be built in Teesside producing up to 75,000 tons of renewable liquid gases as from the first quarter of 2027. So the industry has been on a pathway of looking to decarbonise without any regulatory support. By that I mean, any message from Government to say they will support our industry as a solution for a mixed technology approach.

Q227 Mark Garnier: Is it slightly risky, not knowing what the policy is; or to put it another way, is it possible that a policy could come in that could scupper what you have been doing so far?

George Webb: The lack of clarity around the future for off-grid will stop investment coming forward to produce renewable liquid gases. What we as an industry need is clarity from the Government on where off-grid is going to go. My viewpoint is that it should support solutions where heat pumps will work, but let us also look at other options where heat pumps are not a solution.

We want to build an industry with green jobs in areas like Teesside, where we could be at the forefront in producing localised renewable liquid gases. Having said that, there is going to be a finite number of feedstocks



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so we also need to be working with the Government and looking at how we maximise those feedstocks.

There is going to be a large spike in aviation production, allowing bioLPG to be created as a by-product, so we need to make sure that fuel also comes back into the chain to heat people's homes.

Q228 Mark Garnier: There is an interesting argument about all that. I have come across a company which converts plastics into rocket fuel, but presumably at some point, we will run out of plastics. It is rather like natural gas. Eventually you run out of it, even if it is 100 years away.

George Webb: There is a lot of competition for feedstocks and for the fuel that is produced. If we want to look at heating homes and giving off-grid consumers an affordable choice in a mixed technology approach, we need to look at diversifying by-products from SAF, products like bioLPG, into that consumer chain.

Q229 Mark Garnier: Are bio-liquid fuels a long-term solution as part of the mix, or is this a stopgap until something else comes along in 20 or 30 years?

George Webb: As an industry, we see LPG today as a transitional fuel, because it is the lowest carbon emitter of all the fossil fuels. We see it as the best option for consumers for today. Going forward, we see rDME, renewable liquid gases, and bioLPG as being a long-term solution. When you look at the fabric makeup of most properties, including those off-grid, you can insulate them, but they will not support a heat pump. We see ourselves not only as the sole solution where heat pumps do not work, but also as a solution through a hybrid system, providing backup support to the heat pump when it gets cold.

Mark Garnier: So, you see hybrid systems—

George Webb: As part of the solution.

Q230 Mark Garnier: Anybody else want to talk about that?

Professor Eyre: I agree with a lot of what George has said about the near-term future, but the phrase off-gas grid is increasingly problematic. I live in the middle of a city. I expect that city to be off the gas grid by about 2040. We will be very low down the list of areas where hydrogen will be a priority because there is no major processing industry in Oxford. I expect that the decision in 2026, however much hydrogen it is suggesting there should be, will be that cities that are essentially service industry cities will not get a hydrogen network. That means we are talking about no heat networks or electricity.

Q231 Mark Garnier: You really think that is the case?

Professor Eyre: It is extremely unlikely that we will choose to have hydrogen everywhere. I completely endorse the findings of the National Infrastructure Commission on that, and it has actually been even



stronger and said that hydrogen network conversion does not have a role anywhere. I am sure you have been briefed on that.

Q232 **Mark Garnier:** During the last session, there was a question about the leakability of hydrogen through pipes.

Professor Eyre: I am not an expert, but from everything I have heard, that is right. The iron mains replacement programme is going ahead. We have a very strong safety regulator, and safety would not be my worry about hydrogen. It is cost and scale. We have 300 terawatt hours of heat to replace. We are not going to do that by using green hydrogen, because we have much better uses for it.

Q233 **Mark Garnier:** So how will Oxford heat itself in the future? Through electricity?

Professor Eyre: Electricity, either through individual heat pumps to homes or through heat networks, or probably a mixture of the two.

When we talk about how it is going to heat itself, it is important to distinguish between the network—in Oxford's case, electric networks and heat networks—and where the energy comes from. Some energy may come from bioenergy, but most of our energy is likely to come from electricity for heating.

Mark Garnier: And from district heat pumps?

Professor Eyre: Yes, heat pumps can be at various scales, so they are more efficient on heat networks. I am sure Jody will want to talk about this. They are more efficient because you can run lower temperatures, and you have larger heat pumps, so there is a big advantage, but you have the obvious disadvantage of the additional capital cost of the network.

Jody Pittaway: Linking that back to the off-grid issue, heat networks are not generally a solution for rural areas. You need low density to justify the capital cost of putting pipes in the ground. We are all about capturing waste and recoverable heat sources, some which are free, to distribute to customers. Potentially there will be excellent sources of waste heat. R1C heat and EfW heat, which is a long way from a town or city, might have the potential to serve a local community, but it is not a strategic UK-wide solution for rural areas; it is very much about low density urban areas.

Mark Garnier: I have seen it in Ulaanbaatar, where they do exactly that.

Q234 **Mark Pawsey:** My question about heat networks is for Mr Pittaway. What proportion of homes are heated by a heat network today, percentage wise?

Jody Pittaway: I think it is in the region of 500,000 out of 20 million, so 2% to 3%.

Q235 **Mark Pawsey:** What potential exists, and how will it help



decarbonisation?

Jody Pittaway: The Climate Change Committee and DESNZ are looking at somewhere between 16% and 20% of UK heat from all pathways to zero carbon.

Q236 **Mark Pawsey:** That is a huge increase in proportion from what we currently have. Where is the heat going to come from?

Jody Pittaway: There are a range of sources, ultimately not natural gas. At the moment there are some fantastic projects in the UK that I am sure you are aware of, but first and foremost capturing higher grade waste heat sources, for example, energy from waste plants, industrial and commercial as I have mentioned. Coming down the scale, data centres represent—

Q237 **Mark Pawsey:** Just to be clear, today we are simply sending that heat off into the atmosphere?

Jody Pittaway: Yes, it is wasted heat; as a result, in lots of cases, though not always, there is a good argument to say it should be free to the network operator. Potentially, there is a huge untapped waste heat resource in this country, much of it already existing in urban areas.

Q238 **Mark Pawsey:** Why has there been no incentive, or no fiscal incentive, to make use of that up until now?

Jody Pittaway: That is a good question. There are incentives and Government support for the cost of installing the networks, but there is little, if any, incentive for “owners” of that waste heat to engage with the process and sell the heat. Hopefully, through the zoning mechanism that is being developed at the moment, there will be a requirement for waste heat owners to engage with the process and a framework for them to be recompensed fairly.

Q239 **Mark Pawsey:** We know that we can meter gas and we can meter electricity. Many of us will have had a heat network, for instance in university halls of residence, where there was a huge incentive to leave the radiators on and open the windows—which is a very inefficient use—because we paid a set sum regardless of how much heat we used. Can we effectively meter heat to make certain that people do not waste it?

Jody Pittaway: Yes, we can, absolutely. Every network that is being built at the moment will have metering installed at the customer point. There has been a lot of retrofits of meters on to networks in the way that you have described. But the ambition should be for every customer to be metered, absolutely. The technology is there now.

Q240 **Mark Pawsey:** My previous question was about the consumer viewpoint. Given that very few consumers will be familiar with a heat network, what is the consumer attitude towards being offered it? To supplement that, presumably it is only worthwhile doing it if everybody in an area, whether it is a block of flats or a geographical location, takes it up?



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Jody Pittaway: It is, yes, absolutely. The economics work best when you have density of demand. If you take domestic customers, the optimal scenario is blocks of properties, blocks of flats, and bulk supplies into those buildings. There would be an expectation, if you are retrofitting, for example, that everyone in that block would be taking that supply of heat.

To your point about the customer experience, we have been doing this for about 10 years in the UK and most of the sites we have done are new build. It has been a very significant customer journey from a period when most customers did not know what the technology was, did not know what the thing on the wall in their property was, and did not understand how the heat charges worked. For the sector, and probably through Government, that communication piece of selling the concept and understanding what it means to be on the heat network is really critical.

- Q241 **Mark Pawsey:** The growth that you said potentially exists, does that arise from new build? It seems a nonsense that we are building new blocks of flats and putting a separate method of generating heat in every single flat when there could be a communal system. It seems barmy that we are still putting individual boilers in individual flats. Does the growth you have spoken about come from new build or from retrofitting?

Jody Pittaway: Predominantly retrofit.

- Q242 **Mark Pawsey:** Is that not clumsy? Do you have to run pipes around places that do not currently have them?

Jody Pittaway: There is going to be disruption, for sure. In many places it is new infrastructure, but it offers the potential to bring lower cost heat to those buildings. In heat networks, we talk about anchor loads, which might be a hospital or a university or those blocks of flats we talked about. They are the things that enable you to get the network on its way and other customers can then connect and benefit from that in time.

- Q243 **Mark Pawsey:** Of that growth you spoke to us about, can it all come from waste heat or would there need to be large boilers, whether hydrogen or electric, in order to generate heat in an area where waste heat is not available?

Jody Pittaway: In part it links to the electrification piece. The higher the grade of heat we have, for example, energy from waste heat, we can take that heat and retrofit an existing building with a gas boiler for space heating and hot water, almost on a like for like basis. There is no need for electricity other than a bit of pumping around the network. For lower grade heat sources, we will need to boost that with larger centralised distributed heat pumps. We will be able to use big amounts of thermal storage, so we can move our peak electricity load around and support the grid. Effectively, the solution is through waste heat and electrification.

Mark Pawsey: What do you need and what do the Government have to do to make it happen?



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Jody Pittaway: There are a few things. I talked briefly about the clarity of the message when natural gas is no longer an option for you as a customer. We need to do the rebalancing work on electricity. I know you have talked about it extensively already, but the ability for us to compete with a gas network with all that sunk investment and a relatively low cost of commodity is really difficult.

From a private sector perspective, there are huge amounts of investment ready to come into this sector, but it is about being able to show scale of opportunity, a clear pipeline and probably specifically zoning a standardised way of procuring those services.

Q244 **Mark Pawsey:** Is there something the Government could do to make the people creating that waste heat offer it to people like yourself, to district networks, to make use of it? That seems to be the mismatch right now.

Jody Pittaway: It is, absolutely. As a heat network developer, we want to go out there, we are spending money, we want to put these pipes in the ground, but we do not have control of the heat source like we did with gas CHP, and we do not have control of the customer. I would much rather use carrots than sticks, but a zoning framework that brings major players in a given area to the table, in a fair way, is critical.

Q245 **Chair:** Just quickly, if I am living in an estate, a street of 20 houses, let us say, would it be better having 20 heat pumps in our houses or to go for a district heat pump that would do all 20 houses? Say we are all getting heat pumps.

Jody Pittaway: Low-density properties, semi-detached or detached?

Chair: Let's say semi-detached.

Jody Pittaway: I would say the economics of a heat network for those properties would be challenging, unless you were to go in—

Chair: So individual heat pumps would be better?

Jody Pittaway: Probably in most scenarios, I would say.

Vicky Ford: Semi-detached?

Jody Pittaway: Low density.

Vicky Ford: As opposed to a street.

Jody Pittaway: Or terraced equivalent.

Q246 **Vicky Ford:** We have just passed the Energy Act 2023: does it go far enough in facilitating heat networks? Does the industry have enough clarity on the Government plans, or do you need more?

Jody Pittaway: It is really welcome to see the concept of zoning and the move towards Ofgem as a sector regulator. That helps to enable conversations with customers that put us on a more equal footing with



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the existing regulated utilities in terms of customer protection, the trust piece, and in time, the price regulation piece. That is critical.

We have talked a little about the phasing out of gas boilers. The critical bit is the affordability of the heat that we are providing to customers, and we are doing some work on that within Heat Networks.

Q247 Vicky Ford: The point of us doing this report is that the Committee can make recommendations on future things. Do you need more than what is in the legislation we have just passed? If so, then what?

Jody Pittaway: We need more to support the cost of heat coming out of the pipe. We need mechanisms that help us access renewable electricity more cheaply, perhaps off-peak electricity. We need incentives for heat owners to come to the table, and potentially mechanisms for them to be rewarded, or the network developer to be rewarded, for providing that heat. We need to recognise the massive flexibility benefits that heat networks bring to the electricity network.

Q248 Vicky Ford: Does that need a legislative approach or guidelines?

Jody Pittaway: Regulation or price support type mechanisms, for example RHI, would be very helpful.

Q249 Vicky Ford: Is there a risk that by over-regulating, we end up stifling innovation? For example, I love the idea that if you are building a new data centre, you put it beside a community swimming pool. You put the places that are generating extra heat beside those that need it. If we over-regulate, would we stifle these sorts of clever ideas?

Jody Pittaway: It depends on where you are regulating, but customer protection is critical. I touched on price regulation: if that is too intensive too soon, it could be a challenge. I would welcome innovation in customer service.

Q250 Vicky Ford: What you are asking for is the Government to look at how they create a market for excess heat to make sure it is captured?

Jody Pittaway: Yes.

Q251 Vicky Ford: Do you think local authorities are able to co-ordinate this relationship when they are looking at planning, delivering, and maintaining a heat network? My local authority area is one of the fastest to build new homes, but I do not see it putting in community heat solutions. Without being rude about my local planning department, is it just not focused on it, or does it not have the tools?

Jody Pittaway: It is really challenging.

Q252 Vicky Ford: How do we improve that?

Jody Pittaway: You are asking it to plan, deploy, and run major energy infrastructure, and that is a problem.



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Q253 **Vicky Ford:** To plan, or to enable that to be planned for within the planning system?

Jody Pittaway: Traditionally, over the last 10 years, the model has been to fund local authorities to do those things: taking networks through planning, development, feasibility, and then procuring someone to build them. We have seen a huge stagnation in projects in that period of time. There are lots and lots of feasibility studies sitting on shelves and networks not being built, so we advocate a model that enables a developer partner to sit alongside the local authority bringing the investment.

Q254 **Vicky Ford:** Why does the developer, who has been given planning permission for another 400 homes, not deliver the community heating strategy as part of the plan?

Jody Pittaway: We have seen that in some places, London and Bristol for example.

Q255 **Vicky Ford:** How do we give the capacity?

Professor Eyre: I should say I act as adviser to Oxford City Council on energy and climate, so these issues do come up. We have a structural problem in the planning of housing and planning of land use more generally. These have historically been very disconnected from energy planning and that is probably not going to work in the world that we are moving towards.

Just as an example, it is not going to be sensible to provide all three types of networks—heat, hydrogen and electricity—to every house. That is going to be very wasteful. We need to find systems of bringing together the relevant actors. Local area energy planning is the term that is generally used.

Q256 **Vicky Ford:** Is there enough of a mandate to local authorities to be looking at that?

Professor Eyre: There are no resources, there are no requirements, and there is very little capacity either, as Jody said.

Q257 **Vicky Ford:** So, it might be helpful if we were to recommend that when planning new developments, there should be local area energy planning as well.

Professor Eyre: When planning new developments or retrofitting. This is going to have to go further than new developments; it is going to have to go into the existing housing stock as well.

Q258 **Vicky Ford:** Nick, you have talked a bit about carrots, sticks and tambourines; how can we also make sure that consumers have really good access to impartial personalised advice, and how should we tackle misinformation?



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Professor Eyre: Again, for transparency, I should say that I used to work for the Energy Saving Trust when it set up nationwide advice centres which, as you will know, Chair, still operate in Scotland, but not in England because that publicly funded service was defunded in 2012, at around the same time as the Green Deal. Quite a lot went wrong in 2012, in my opinion.

There will need to be a composite approach. There is a role for publicly funded impartial advice, because as you heard in the last session, information about these things is often very poor, and trusted impartial sources can be important. I also think that the installer trades are going to have to offer better advice on how to operate systems; I think they are actually beginning to do so. We are looking at more complex heating systems in the future than in the past. Just fitting it and walking away is not good enough. We are moving towards standards in retrofit, for instance, with retrofit co-ordinators who could probably do a better job there. It will have to be a twin-track approach between the private sector and the public sector.

Q259 **Vicky Ford:** In terms of the potential to reduce energy demand from home heating, how much of this reduction do you think is going to come from more efficient technologies versus behavioural change?

Professor Eyre: Some will come from behavioural change. We have seen quite a big slice in behavioural change in 2022; we have seen roughly a 10% reduction in gas use, which is broadly equivalent to a 1° change in thermostat settings. My worry would be that most of those changes in thermostat settings are in homes that are already cold, essentially because poorer people have been the most under pressure in the cost of living crisis.

Q260 **Vicky Ford:** Do we know that, or is that your suspicion?

Professor Eyre: That is a suspicion at this stage. Colleagues are working on it; we have anecdotal evidence, but not evidence that I would want to say is absolutely certain. But to be honest, it is hard to believe it is anything else.

Vicky Ford: No, I disagree. There are plenty of people in larger homes who have turned down their thermostats.

Professor Eyre: We can agree we need proper evidence.

Vicky Ford: I do not think you should jump to the conclusion that it is obvious at all.

Chair: Generally. It is a generalisation.

Vicky Ford: If there is evidence, there is evidence.

Professor Eyre: In answer to the first question, most of the energy demand reduction we can get is through physical measures. Very



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familiar, relatively low cost measures like loft insulation and cavity wall insulation have still not been fully rolled out and that clearly ought to happen.

Many houses are already underheated. We should not be asking people to turn down thermostats further in those cases.

We need to be cautious about more expensive whole house retrofit because it can be very expensive and raises the same sorts of questions about heat pumps and hydrogen, but even more so. If we are talking about £20,000, £30,000 a house, that is clearly unaffordable for many people.

The point that is most important is that the biggest energy demand reduction we can get is by moving towards more efficient heating systems, notably heat pumps. Even changing the efficiency of heat pumps from, say, 250% to 300%, which was the number that Charlotte Lee mentioned, saves more energy than insulating every solid wall in the country.

Q261 **Vicky Ford:** Are you suggesting that heat pumps are not efficient enough at the moment?

Professor Eyre: We know from the trials done by the Energy Systems Catapult that initial installations were, on average, poor, at typical efficiencies of maybe 220%. They have now gone up to 280%, the industry is quoting 300%, and they can certainly get there. With better technology and in particular better installation practice, we can make those benefits. As I said earlier, where we are putting them on heat networks, we would expect to get even better performance than that.

Q262 **Vicky Ford:** Just to clarify, the reason why I did not jump to an immediate conclusion is because we know that actually it tends to be those in social housing and those on benefits that at the moment have better insulated homes, and that less home insulation has been put into owner-occupied homes, so people turning down the heating in those homes would also—

Professor Eyre: I agree with that, but I would say that the private rented sector is the worst and most problematic.

Q263 **Vicky Ford:** I just want to come back to the rural areas issue. Some 20% of the homes in the east of England are currently off-grid because they are in “rural” areas—my constituency is all on-grid because it is a city—but it is not fair to say that these are all isolated farmhouses. Many are large villages and small towns that are currently off the methane gas grid. I just wanted to make that really clear, because some will be suitable, I suspect, for community heating sources and some may be suitable for a new localised gas grid.

I understand that the rules are not there at the moment to introduce a localised hydrogen gas grid in an area that is currently off-gas, but why



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are we assuming that everywhere that is in a “rural” area has to carry on having a liquid solution, be that oil or other new forms of liquid gas delivered by a truck to fill up a tank outside their house, or a heat pump? We should not be assuming that.

Many of those homes would be suitable for heat pumps as well, which is another error that is often made. Do you agree?

Professor Eyre: I agree with that. Historically, the reason that people have thought heat pumps should be prioritised to off the gas grid is to do with cost, particularly where people are using oil boilers or, even worse, electric resistance heating, because they have very high heating costs at the moment. So, I suspect that biofuels in general will have a role to play, but yes, given that a large proportion, as you say, of every part of the UK has off-gas, then substantial amounts of that can be electrified.

Q264 **Vicky Ford:** Electrified or turned into a community heating system.

Professor Eyre: I will allow Jody to answer that, because I am sure they have looked at it in more detail.

Jody Pittaway: The distinction I would draw is that, if you have a good, high-grade source of heat in the vicinity, because it does not make sense to have a large air source heat pump on a centralised energy centre and install all that pipe for relatively low density properties, you probably are better off putting those heat pumps on to the properties. If you have heat available cheaply at a higher temperature locally, then the economics can look quite different, so it is probably a local consideration there.

Q265 **Vicky Ford:** Or, indeed, a local hydrogen network.

George Webb: Can I just come in on that? It comes back to the fact of the mixed technology approach. There is no silver bullet here: there are going to be a number of solutions. Looking at off-grid, hydrogen may not be a solution to certain parts of the hybrid sector. That is where renewable liquid gases come in, and it comes back to that mixed technology approach, giving consumers choice. We could polarise it too much into a detail where it does not suit everybody.

Q266 **Lloyd Russell-Moyle:** Do you think the Government are focused enough on the potential for home heating systems to provide flexibility to the wider electricity system?

Professor Eyre: Historically, of course, that is exactly what Economy 7 is, so we have done it for a very long time. I suspect your question is more about the future of heat pumps.

The work that I have seen indicates that there is certainly scope for heat pumps to contribute to flexibility. In concrete terms, that means switching off the heat pump at times of high electricity prices, which is likely to be in the evening when people require heating, so you have to store the heat either locally or on a district network with hot water heating. To some extent, you can use the thermal fabric of a house, so if



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it is well insulated you could probably get a couple of hours of flexibility out of it.

Q267 Lloyd Russell-Moyle: We used to have decently insulated hot water tanks in almost every house, and you would heat them up through a variety of different means. When that hot water ran out, you would run upstairs and turn the immersion on to try to get a bit more hot water if your siblings had taken too much for the shower that morning.

Now we have gone through a process of ripping those out and putting in completely wasteful combi boilers, which offer energy on demand but with no sense of smartness. Do we need to go back to the future and start reinstalling proper heating systems that store heat?

Professor Eyre: Yes, that would be useful, although it is important to emphasise that a domestic scale water tank is only really good for storage for a day. There is a surface area to volume problem. The bigger the tank, the longer it can provide storage.

There are district networks in Denmark where they are doing inter-seasonal storage, which obviously needs quite a big tank, but there are a range of solutions, and of course storing hot water is a relatively cheap form of energy.

Lloyd Russell-Moyle: Inter-seasonal is amazing: you heat it up and it lasts for months on end.

Chair: So, it has to be big?

Professor Eyre: Yes, and well insulated.

Chair: You learn something new on this Committee every day.

Lloyd Russell-Moyle: There is also some stuff on using sand rather than water.

Professor Eyre: Yes, and that is the key point about long-term energy storage: it needs to be really, really cheap. Hydrogen can be fairly cheap, and that is mostly what people are looking at for long-term energy storage, but stuff like sand, bricks and hot water are other options.

Q268 Chair: I am sure that this is the first time I have heard of inter-seasonal storage; the longer you are in the energy area, the less you know. So how long is a season, three months is it? What is it stored in, and for how long?

Professor Eyre: Typically, you might use solar energy in the summer when you have low heating demand, put it into a hot water tank and then take it out in winter.

Chair: A huge hot water tank.



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Professor Eyre: That is going to be one of our big imbalances, it already is, but we have traditionally solved it through tanks of oil.

Q269 **Chair:** What sort of volume are you storing this heat in?

Professor Eyre: Big. I could find an exact number for you, but it is big.

Q270 **Chair:** The size of a big loch, or something like that? Is it open air stuff, or all insulated?

Professor Eyre: All insulated.

Q271 **Lloyd Russell-Moyle:** We are talking the size of a warehouse, no? Or the size of a building?

Professor Eyre: Jody may have some better information.

Jody Pittaway: I know some big solar thermal systems like that; they are well insulated, the size of a small lake, I suppose. I can give you some dimensions.

Q272 **Lloyd Russell-Moyle:** Those options work very well where you have a district heating network because it feeds directly into that. It does not work so well where you have lots of individualised heating systems. So this is a bit about place by place, but you need space and land, and you are generally talking about district heating systems in urban dense areas but not in semi-rural dense areas at the moment.

Jody Pittaway: Obviously that is where you would have the potential for that kind of space. But I would say just very quickly on thermal storage that our networks, which typically concern 1,000 to 4,000 customers, will have a thermal store that is about 100 meters cubed. The height of this building, perhaps the diameter of the space here, will provide us with two, three, maybe four hours of storage in the peak winter period. It is not huge, but it does enable you to move your peaks quite significantly, and it is really cheap.

Q273 **Lloyd Russell-Moyle:** Three hours, and that is just a vessel the size of this building, within this bit here.

Jody Pittaway: Yes, it is easy to place within a basement.

Q274 **Lloyd Russell-Moyle:** And that allows you to shift from the peak at night, where your energy is lowest, to the middle of the day, where even in the winter there is still some thermal activity.

Jody Pittaway: I would set it up pre the morning peak for example, absolutely, so it is ready to go at 6 o'clock or what have you.

Professor Eyre: I would caution that the nature of our energy system is changing. We cannot assume that the idea that energy will be reliably expensive in the evening and reliably cheap in the middle of the night will be the case in future, particularly if we have a lot of solar on the system, as then we will get a midday low-cost period.



Q275 **Lloyd Russell-Moyle:** That might be good if you are trying to transfer it to the evening.

George Webb: I will just come back on where heat districts are not suitable. We already operate a metered estate system. We have tanks in the ground, or above ground, with meters on properties. A lot of it is on home parks. Where that is not suitable, we can have a solution for those metered estates where a consumer can have renewable liquid gas through the pipe that comes out through a meter. That can be an electronic meter, read remotely, read daily, weekly, monthly, yearly, whatever, and the renewable liquid gas can be made from localised, non-recyclable waste. So there is another solution, and that is what we have at the moment.

Q276 **Lloyd Russell-Moyle:** I was interested that you said a lot of these rural houses are not suitable for heat pumps. I wanted to explore that a bit more.

In most rural areas that you were describing that were not appropriate, we are talking about areas with a decent amount of land around them. Why are they not suitable? Surely, they would be suitable for ground source heat pumps. The problem with ground source heat pumps in urban areas is that drilling down to the ground is so expensive, but surely rural areas are prime ground for it. Why should we be backing off heat pumps there, where it seems to me that their ground is perfect for it?

George Webb: The thermal differences between off-grid properties are quite high. Where there is thermal heating for a property that is suitable for a heat pump, that is fine. However, you can spend a lot of money on insulating an old property, you can bring it up to the highest insulation specifications, but a heat pump still cannot get it to the temperatures that consumers want.

That is why we are looking at renewable liquid gases. We have supplied you with some archetypal evidence on the work we have done looking at levelised costs, taking in installation costs, and the running costs where renewable liquid gas is actually a better option financially going forward than putting a heat pump into those properties. Where a heat pump works, we support it, but there are going to be many properties where, even if you get the insulation up to the highest standard possible, a heat pump is not going to be sufficient.

Q277 **Lloyd Russell-Moyle:** A charity that I am involved with has stone buildings in the Peak District; we have one in Yorkshire as well, and one down south, we have a few. They are old, falling down buildings that we managed to insulate sufficiently for heat pumps or other forms of heating to work.

It would be really interesting to see what is the exact fabric of the buildings we are talking about, or is it that the consumer is wrong in terms of the level of heat that they desire?

George Webb: Every consumer is different.



Chair: We have just one minute left.

George Webb: We can supply you with all the archetypal evidence that we have done on the reports that we have for you, but every property is different, every consumer is different. It also comes back to cost. You are looking at the cost of insulating properties, which can be up to £30,000. A lot of rural consumers cannot afford that cost, and so it comes back to consumer choice again: giving the consumer the choice of how they want to heat their homes.

Q278 **Lloyd Russell-Moyle:** They do not have a choice now, do they? They can only use one product, which is LPG. Giving choice is the wrong question, surely. We need to give people a viable option.

George Webb: We think it is a viable option for the best choice to get to net zero. Looking at the choices today, they can use a heat pump in rural offices, they can use LPG or oil. As we stand going forward, for consumers, it needs to be the right option to meet the objectives we all want, but also give them the choice of what they can afford and what they want.

Lloyd Russell-Moyle: Or we subsidise it.

Chair: Thank you all. I apologise, but time, as ever, has the better of us and Prime Minister's questions are coming up.