

Q&A with Dr Aurore Julien

Q1 Is there a problem with heat pumps - that they will not heat houses sufficiently well if you have to have massive radiations and insulation? Will they just be colder? It sounds like they won't work very well, however cheap they are.

A1- It is not that they don't work, heat pumps just work differently. You can't just turn them off and leave your house for a week and then when you return, turn them back on and expect that your home will heat quickly. They are slower, like underfloor heating.

There is an issue where installers are not sizing the radiators properly.

In addition, it is important to insulate the home first. If you have a home that loses heat very quickly, as in the map that I showed you, it means that when there is a sudden change in temp outside, it will take a long time to adjust. Heat pumps are like marathon runners – they don't sprint well, but they do get there. Controls will need to be adjusted as they work differently.

In parts of Europe, they are very happy with heat pumps, but homes there are also better insulated and don't need the sprinting capacity that we seem to need here. The pumps have a slower response, which we need to be aware of. People must be trained in how to use them. Hydrogen boilers, however, are not a better option.

Q2 Two questions – (i) the gov has announced that they plan to subsidise the installation of up to 90,000 heat pumps. What percentage of properties in England would that cover, and how many might we need for the whole of England? (ii) what new technologies are in the pipeline or are being trailed at present to produce green energy?

A2 – (i) I don't know. The total amount of funding being made available, highlighted in heat and building strategy, at present, is £450m. That would provide about 30m heat pumps a year, which is totally insufficient. (ii) Regarding the range of options – district heating for high-density housing with heat pumps is quite a good way to do things. If you have a lot of flats together, they peak less. Communal heating systems also provide opportunities, with lots of homes together, to have a heat pump and a boiler when you don't have other options. They provide low carbon heat provision with the option of having a boiler to pick up when you have a bit of a problem. Communal systems, once in place, have alternatives around what you put at the end of it. They are a bit more flexible when there are technology changes (and these change all the time). They can also adapt to trends in sustainable energy.

Q3 (i) Regarding the practical elements of heat pumps in blocks or individual flats, district heating systems have a poor reputation with social housing tenants. Many have been ripped out over a number of years because they were just not efficient or didn't work. How do you

see that working in an average block of flats in London that is relatively well-insulated after the decent homes' standard and where changing to a district heating system does not appeal to residents.

(ii) Your overall image seems to suggest that heat pumps are not good unless you have well-insulated homes to put them into. Given the poor levels of insulation in this country, I can foresee that the majority of heat pumps will be grabbed by relatively wealthy people – not those living in fuel poverty and who, as you say, live in poorly insulated homes where heat pumps would be least effective.

(iii) I have this image of rows and rows of houses with heat pumps all pumping out cold air. Is there a problem of creating peculiar microclimates in areas that are a bit cold anyway? Would lots of heat pumps, pumping out lots of cold cool the environment make the pumps less efficient – or is that too micro to affect the macro elements of the environment?

A3 – (i) District heating system can be inefficient, but, modern systems would normally be more efficient - wouldn't leak, would be well insulated and have heat exchanger units to enable monitoring and control the energy, and separate your system or radiators from the district heating system.

These are quite small units, not like the old communal heating systems, and certainly, when you have high density, they can be extremely efficient and reliable, with good maintenance.

(ii) heat pumps are incredibly important - to save energy and deal with climate change. Compared to electric heaters, which are commonly used, they are three to four times more energy-efficient. They are more expensive, at current prices, but things will change. The question is, what is the best option at present? That is definitely heat pumps.

Hydrogen is a no go and is less efficient.

I think heat pumps are a good option, but we must first prioritise insulation. Again, heat pumps will work, they are just a bit slower. We need better controls to ensure that homes are maintained at relatively good temperatures. They will use less energy than gas boilers. This is about knowing how to use them and having good controls.

(iii) in terms of the microclimate – I don't know of any studies that have looked into this. Possibly this could occur in a small area, but not in a way that heat pumps would impact other temperatures. At this stage, I can't see this being something that would have a huge impact on their efficiency.

One thing that it could potentially occur relates to noise. They do hum – think about your fridge, and it has a fan, so the location of the pump is important.

Q4. I have a naïve questions on economies of scale and whether you could have a large heat pump looking after a block or a pump for each flat, about the disruption to tenants – particularly if this relates to the floors (e.g., underfloor heating) and maintaininh the security of peoples' homes.

On the four blocks on my estate, there are noisy and complaining people as we have had a lot of problems with boilers and our landlord recently, and a lot of people shout at meetings and so I'm just getting ready for more of this.

Are there ways of keeping disruption to the minimum and in terms of economies of scale would there be large enough pumps to perhaps service a block at a time?

A4. Yes, it makes sense to have shared systems – not just for economies of scale but also for the potential to improve the efficiency of the system together and the fact that you have the option of having any noise from the system managed separately.

If you have heat exchanger units in each flat, they would increase the costs. There is also a cost in having communal systems.

You don't have to have underfloor heating. But, if your home does not have good insulation, it may need new radiators, which are not so expensive. This is simply because the heat pumps produce heat at a lower temperature, so the temp does not go as high. They are marathon runners and because of that, ideally, you should have a large radiator. They can be a bit more expensive and be disruptive, but not as much as underfloor heating. The larger radiators help keep the heat pump more efficient and functioning better.

