AIR SOURCE HEAT PUMPS
Jill Goulder
April 2023

Background

I have an eco house in Lewes (http://www.jillgoulder.plus.com/green/), with various insulation and energy-saving features, including solar panels and a small storage battery system. It's a two-bedroom Victorian terraced cottage, with plenty of insulation.
In summer 2021 I had an air source heat pump (ASHP) installed, replacing my combi gas boiler for my central heating and hot water.

Why did I do this?

It's now clear that gas, for the boilers that many of us have, is not a good fuel to use. It was subsidised for a long time, but now there is pressure to reduce its use. An ASHP uses electricity to run the system, but with my solar panels and battery storage system, my buying from the grid is comparatively low.
It's a large initial outlay (though I benefited from a Government grant), and I was fortunate in having a legacy from my mother which I am using to invest in energy-saving measures. My boiler was on its last legs, so it was a good moment. And I'm now a carbon-neutral household!
More broadly I felt, as owner of an eco house, that it was up to me to be a beacon of new energy-saving techniques, providing a working example for people hesitating about whether to adopt it. If I didn't do it, who will?

(Vaillant brochure)

The technology in my house

My AHSP was installed by Shoreham firm A Greener Alternative (https://agreeneralternative.co.uk/) in July 2021. It cost £11,000*, of which £5,000 was paid by a Government grant; that's now closed, but there is still RHI (Renewable Heat Incentive).

** The price was inflated by the extensive pipework and wiring needed for installation in my particular house circumstances.*

It's a Vaillant Arotherm Plus 5KW ASHP (https://www.vaillant.co.uk/for-installers/products/arotherm-plus-71424.html), with a Vaillant Unistor Pre-Plumbed Heat Pump Cylinder (150l). It's very low-noise, and uses natural refrigerant R290.

How's it doing?

My combi gas boiler has gone, and instead I have a quite large ASHP 'box' in my back courtyard, and a slimline hot water cylinder in my bathroom cupboard. I'm very impressed that the cylinder doesn't feel even warm to the hand, unlike those old copper cylinders.

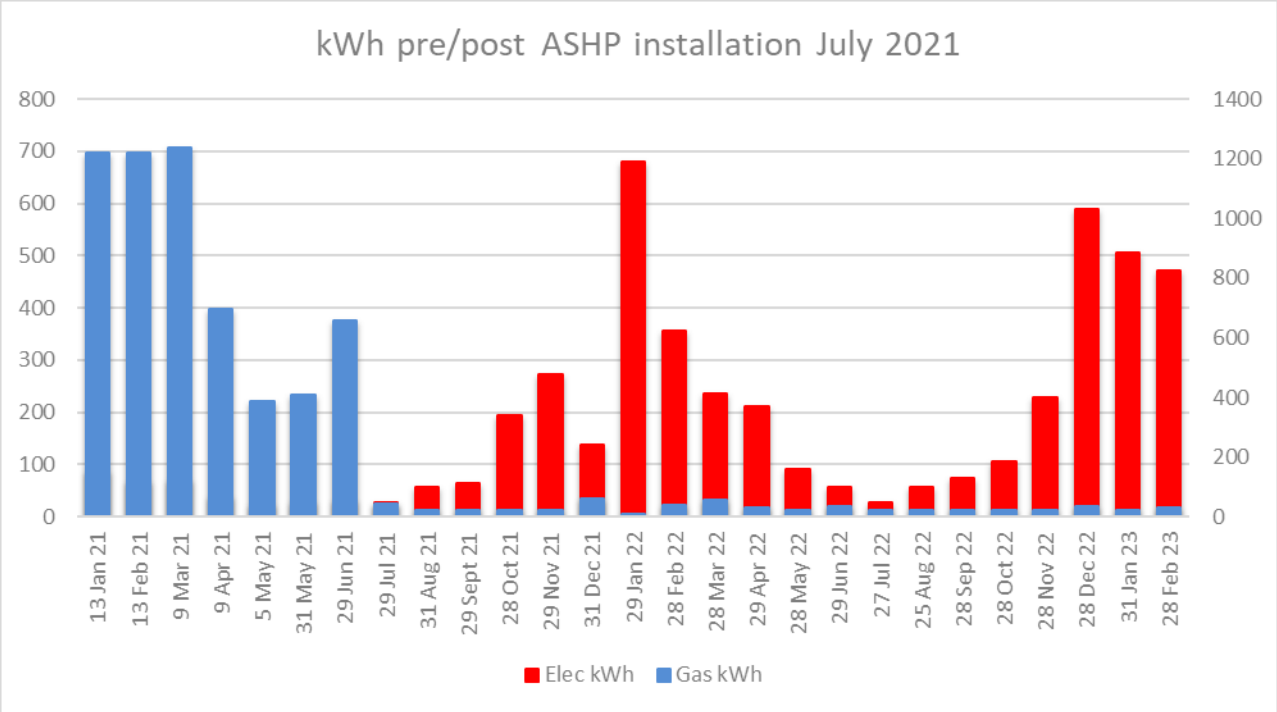
The box gets some sunshine, which will reduce running costs. It's extremely quiet – quieter than a light breeze in the trees, or the distant sound of the main road. I have to go right up to it to hear whether it's on, and even then I have to put my hand in front of the fan to check.

I've been advised that I should set the system to come on longer in advance than a combi boiler, and that it then runs at a lower temperature. The two functions of central heating and hot water are controlled separately:

- hot water: I run the system for 2 hours first thing in the morning (ending an hour before my usual shower-time), and get plenty of hot shower water and washing-up water all day (I live alone). And unlike a combi boiler, the water is already hot so no need to run the shower/taps for a while
- central heating: I'm a chilly person so this is important in winter! I find that the heated part of my house stays at a very constant temperature; I've set it at 19 degrees and put the thermostat/controller in the coolest part of my ground floor, so that in the warmest part of my house it's usually 20 degrees. I notice that the radiators are tepid rather than hot but seem to do the job very well, and the underfloor heating in one room is at its usual temperature

Considerations

- Mains gas: I do still currently have a gas cooker – something that I may change in the future. One thing to bear in mind is that you'll still be charged the **standing charge for gas** even if you relinquish all gas appliances; there are zero standing charge contracts, but I haven't been into them. Otherwise, the only way to stop paying is to get the system of gas supply to your house removed, which could be expensive and might not be a good idea re future sale of your property
- Air source heat is particularly suited to **underfloor heating**, as this runs naturally at a lower temperature than radiators; I have underfloor heating in one room
- On **running costs**, I was guided by an eco-colleague's experience: https://transitiontownlewes.org/why-dont-we-all-switch-to-heat-pumps/. As I understand it, it **won't necessarily be cheaper** – the reason for switching to ASHP is to be carbon neutral and because we're all going to have to go to something similar eventually. Of course with my solar PV and storage batteries I will get a good reduction; since my ASHP was installed fuel costs have gone mad so it's almost impossible to compare in ££ terms; and we've had a warm winter followed by a cold winter. The key measure is **kilowatt-hours (kWh)**, which are shown on your gas and electricity bills. Since ASHP installation, my annual kWh has halved.



Prejudices

ASHP is now being installed in many new houses, but take-up for older houses is low, not least because of considerable prejudice about AHSP:

- 'It's unsightly': yes, it does involve installing a good-sized 'box' (like a big air-conditioner) outside your property, plus pipework. I'm getting used to it, and I like it a lot more than a global future without heating/hot water
- 'It's noisy': no it isn't. Earlier models made a noticeable hum when running (though no louder than a combi boiler outlet) but now the acoustic insulation technology is far better. I have to go and stand right by mine if I want to know whether it's working, and even then I can't hear it if there's a gentle breeze in the trees; I have to put my hand in front of it to feel the cold air flowing from it, to check
- 'I'll need to replace all my radiators': not true. All but one of my c.20-year-old radiators were kept, and the only one changed was far too small and I was eager to increase it anyway.
  I do have underfloor heating in one room, and that's ideally suited to ASHP as it naturally runs at an efficient lower temperature than radiators
- 'I'll have to have a big hot-water cylinder installed': things have moved on a long way since those massive copper cylinders. The one installed here is very slim-line and magnificently insulated – it doesn't even feel warm when I put my hand on it, but yet I get hot water all day from it
- 'My house/hot water won't be warm enough': early days, but I have plenty of good hot water for showers and washing-up, and although my radiators are now warm rather than scalding hot, the house remains at a comfortable 20 degrees all day. You have considerable control over the timing of your hot water and CH, including bursts of heat if needed
- 'You have to have lots of insulation installed': well, lots of insulation is a no-brainer for anyone who wants to be warmer and reduce household bills, so this is

no different from anyone trying to achieve that. Any heating will be more effective and cheaper if you insulate your house well

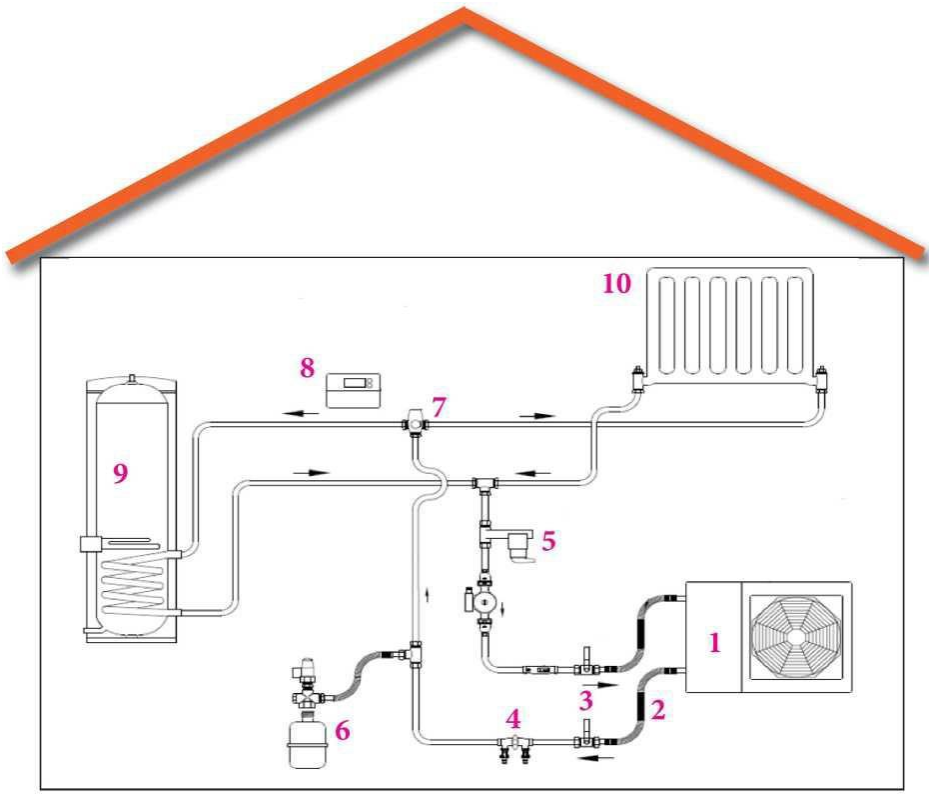
How does ASHP work?

Best to do your research, but here's a description from A Greener Alternative:

> 'An air source heat pump system absorbs heat from the outside air and transfers this to a fluid. The fluid then passes through a compressor to increase the temperature so it can provide the heat for heating and hot water requirements within the home. These systems can extract heat from outside temperatures as low as -15º C.'

And here's another from an owner, Neil Williams (https://transitiontownlewes.org/why-dont-we-all-switch-to-heat-pumps/):

> 'ASHPs suck heat from the air even in sub-zero conditions. They work like a fridge in reverse, taking energy from the outside air and using it to run the heating and hot water systems. In 2018 43.9% of homes in Scandinavia used them and it's much colder there than the UK (GSHPA). Many ASHPs even have outside temperature sensors which tell them to produce hotter water in cold weather to meet the extra demand. They use a little more electricity in very cold weather but this is taken into account in their overall efficiency rating, or SCOP.'



(A Greener Alternative)

With boilers, we're all used to radiators heating up to scalding hot; but then they go off when the room temperature builds up, and on again later. The ASHP system keeps the radiators on for longer, for less energy use than the off again/on again boiler system, and the room stays at the same temperature throughout. So far I (as a

chilly person wanting good heating) have found it a very comfortable temperature, and better in terms of warmth variation than the boiler system.
Meanwhile, for hot water, with combi boilers we're used to turning on the tap/shower and the boiler firing up, with a minute or two of running the tap/shower until the water heats. With this system, including a hot-water cylinder, the water is already hot.