Heat pumps – What should I be asking?

And what are the answers

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Introduction

- Mixed Technology Consultant for Isoenergy, Heat pumps, Solar PV, Biomass, Solar Thermal, EV Car Chargers, Batteries.
- Non Executive Director of South East London Community Energy
- Masters in Renewable Energy Engineering from University of Exeter
- Working towards Chartered Engineer Status with the Energy Institute
- Community Energy England Young Community Energy Champion 2018
- Experienced in technical asset management of MW scale Solar PV plants having been responsible for a portfolio of around 45MWs of community owned solar farms.
- Have worked with in excess of 30 community energy groups across the country.
- Have worked on heat pump installations of all scales across the UK

So Why Heat Pumps?

- The Environment!! Carbon Emission Reductions of up to 75%
- Fuel Savings – Reduce heating/DHW costs by 40-50%
- Financial support:

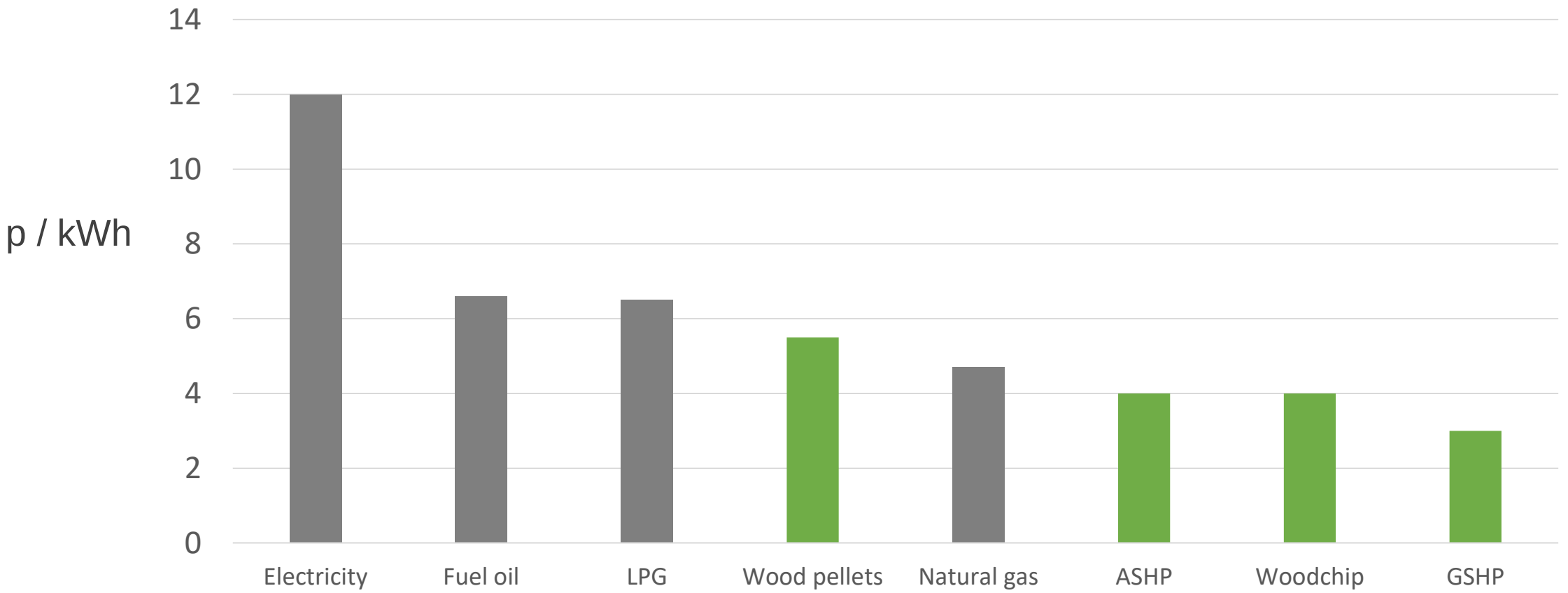
  Domestic Renewable Heat Incentive (Deadline: March 31st 2022)

  - GSHP Eligible for domestic RHI rate 21.29p* p/kWh for 7 years * Capped at 30,000kWhs
  - ASHP Eligible for domestic RHI rate of 10.92 p/kWh* Capped at 20,000kWhs

  Clean Heat Grant (Currently Suggested From: April 1st 2022)

  - Currently proposed as a grant of around £4,000 but things change!!

Running costs comparison

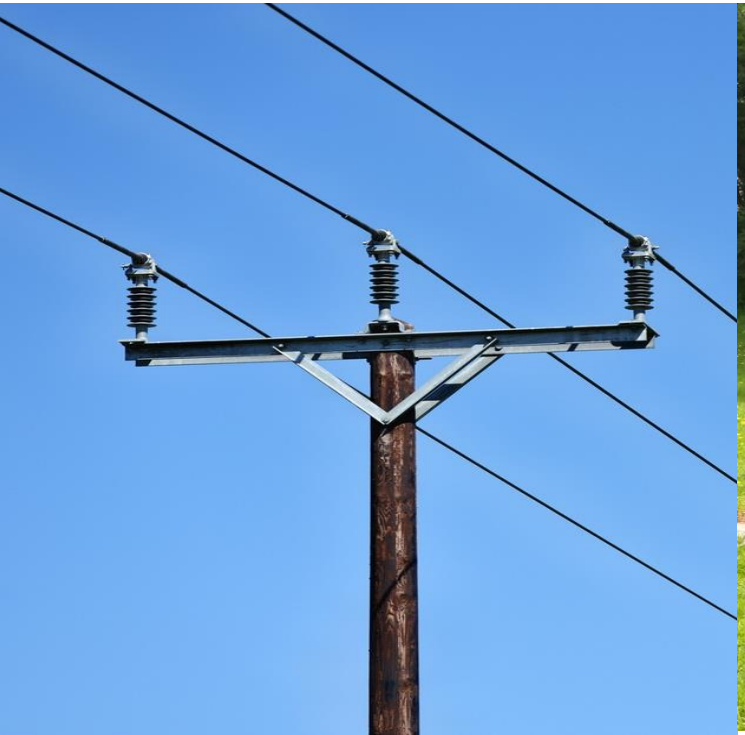


Heat Pumps

- Take energy from the environment and use electricity to run a compressor to raise its temperature for heating and domestic hot water
- Heat pumps use electricity, but can generate more than 4kW of heat for every 1kW of electricity they use.

Air Source Heat Pumps

- Same technology as ground source
- Need to be oversized for UK climate
- Colder the air, the less energy collected



ASHP considerations

Electricity supply

Internal Storage

External unit placement

Unit sizing

Planning permission

Heat emitters

How big an ASHP do I need?

- 120m2 3 bed Victorian/Edwardian town house – (55-65 W/m2) – 6-8kW

1 x 12kW (1ph)

- 180m2 5 bed Victorian/Edwardian town house – (55-65 W/m2) – 10-12kW

1 x 16kW (1ph) OR 8kW+12kW (1ph) OR 1 x 22kW ASHP (3ph)

- 120m2 3 bed Victorian/Edwardian town house – (45 W/m2) – 5.4kW

1 x 8kW ASHP (1ph)

- 180m2 5 bed Victorian/Edwardian town house – (45 W/m2) – 8kW

1 x 12kW ASHP (1ph)

Heat Pump System Makeup

External

Internal

Small ASHP (~ <8kW load)

Larger ASHP (~ >8kW load)

Internal Space

Air Source Heat Pumps

Small Heating Loads
(Combined Unit)

Larger Heating Loads (Hot water tank + Buffer tank)

Heat Pump: External (Ground Mounted – Sunny Spot marginal gain perhaps – temperature key)

Combined Unit

W: 1.5m

D: 1.5m

H: 2.2m

Hot water + Buffer Tanks:

W: 3m

D: 1m (+0.5m Maintenance Access)

H: 2.2m

External Unit Placement

- In the sun? – Slight effect on efficiency but air temperature more important rather than irradiance
- On a roof? – Unlikely, more expensive due to plumbing & Weight concerns
- Distance from tanks? – Can go at a bottom of the garden but significantly more expensive for every meter you go away from the tanks
- Distance from Walls? – There needs to be space (ideally around 0.5m) behind the unit to collect energy and we would recommend cautiously 1.5m in front of the unit to expel cold air.
- Noise? – No louder than a boiler flue. Run loudest when coldest so away from bedrooms

Electrical Supply

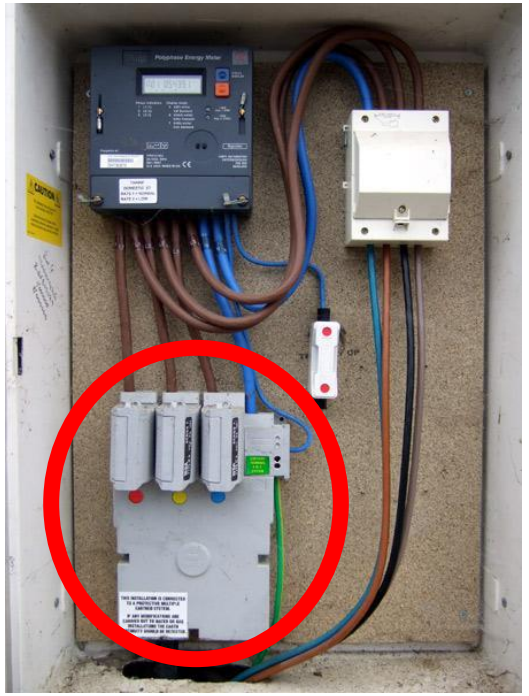
Single Vs Three Phase

Single Phase Supply

- 1 Main Breaker/Fuse
- Rule of Thumb: 11kW Heat Load Limit for an ASHP

Three Phase Supply

- 3 Main Breakers/Fuses
- Heat load limit is only restricted by capacity of supply
- 100A 3ph (Standard connection) Rule of Thumb 40 kW with domestic units.



Hybrid Systems

What do we mean by hybrid?

- Boiler + Heat Pump
- Solar Thermal + Heat Pump

How does is work?

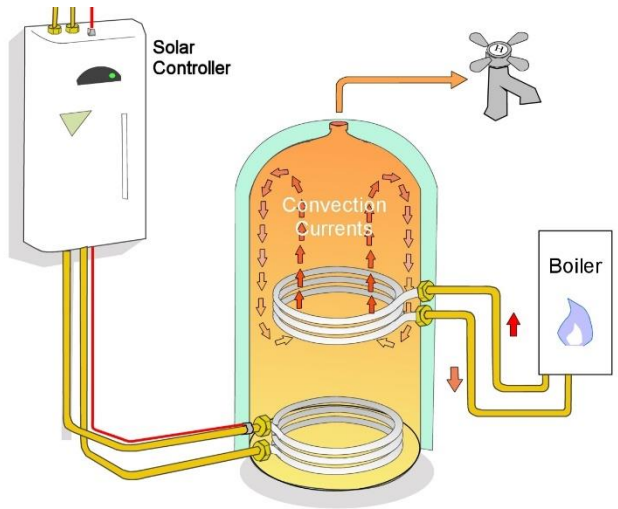
- Boiler acts as top-up at low temperature
- Solar Thermal provides hot water(mostly in summer) increasing longevity of heat pump

What do I need to make it work?

- You will need a twin coil tank

Costs?

- More expensive due to labour and extra parts
- More expensive to maintain two systems rather than one
- Lowest possible running costs Heat Pump + Gas boiler BUT won't be the case in the future.



Heat Emitters

- Underfloor Heating? Great – BUT not necessary

- Radiators? – Need to be sized correctly. Rule of thumb: 1.6 x boiler temperatures BUT usually already oversized

- Fan Coil Units/Air Blower Units? – Heat exchangers need to be correctly sized

The Costs

ASHP

- Quality domestic systems range from around £13,000 - £30,000 for a single unit system.
- For multi-unit sites £25,000 - £60,000

- £60,000 would give you around 40kW of useable heat – above this it would either be a commercial ASHP or GSHP

- Hybrid systems – Boiler/solar thermal integration and the extra labour/equipment required could mean an additional cost of £1,500- £5,000 dependent on the size of system.

Case Study: Grant Street

This terrace house on Grantchester Street was being renovated by the owners. As part of the renovation, they wanted to reduce their heating bill and carbon footprint, so contacted isoenergy to discuss the available options. The house was previously heated by mains gas.

Isoenergy installed a split-system air source heat pump.
Key features:

11kW Hitachi air source heat pump delivering a heat load of 8kW @ -7 degrees

Integrated hot water tank

Reduced running costs against main gas

Indicative Cost - £12,000.00 - £16,000.00

SIZING IS CRUCIAL!!!

When it all goes wrong

Conclusions

1. Understand your houses heat usage – Review/Get an EPC/Thermal Imaging/Heat Loss & Heat Emitter Survey
2. If you can, Improve! Insulation, Double Glazing, Draft proofing
3. Test to see if you are heat pump ready. Turn down your heating to 45-50 degrees and leave it on.
4. Explore renewable technologies such as heat pumps.

Thank you

Any questions?

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