

Ground Source Heat Pump Association Webinar Series 2020

How to ensure your heat pump is smart grid ready.

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Types of domestic Heating systems in the UK



Heat pumps



Gas Boilers

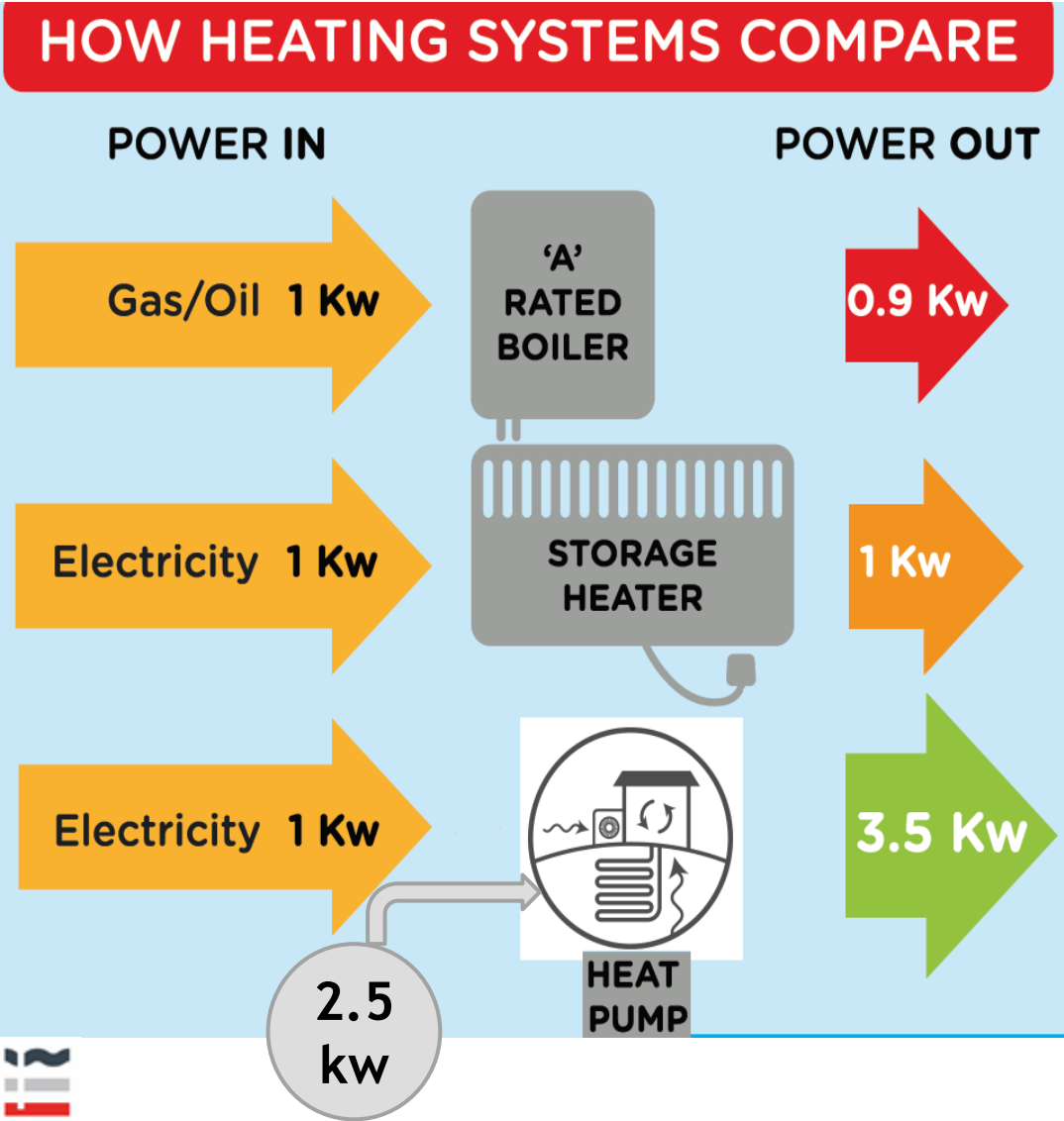


Oil central heating



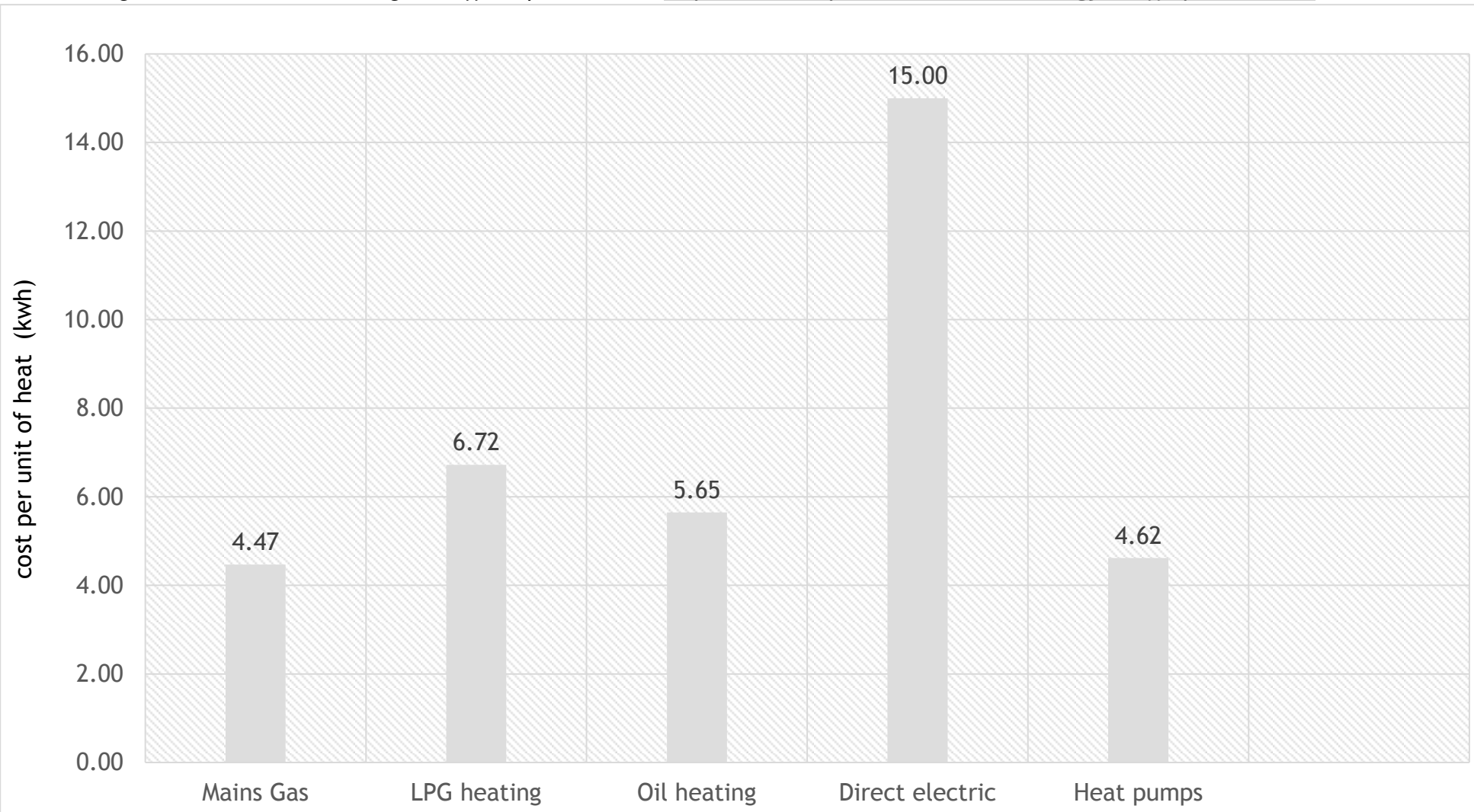
Electric Heating

How heating systems compare with regards to efficiency



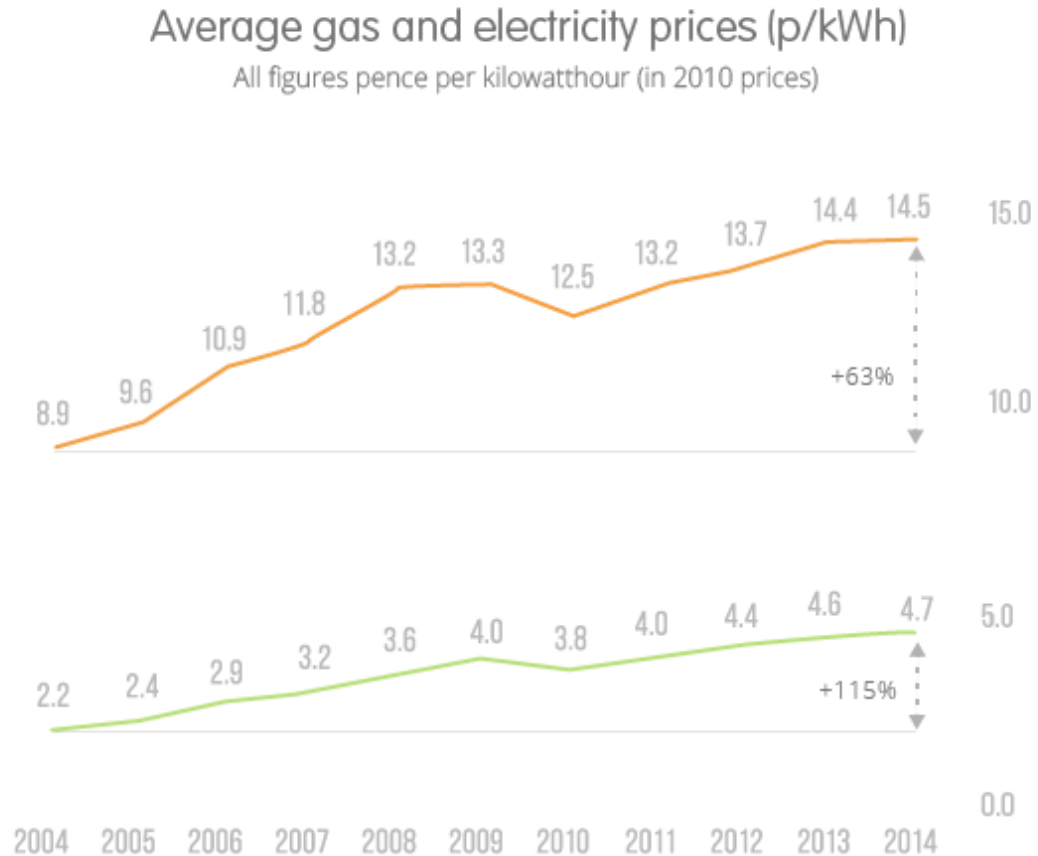
How heating systems compare with regards to running cost

using standard uk Electric and gas tariffs as published on https://www.ukpower.co.uk/home_energy/tariffs-per-unit-kwh



The cost of electricity and gas in the UK

- Cost of electricity is generally 3 - 4 times more expensive than gas

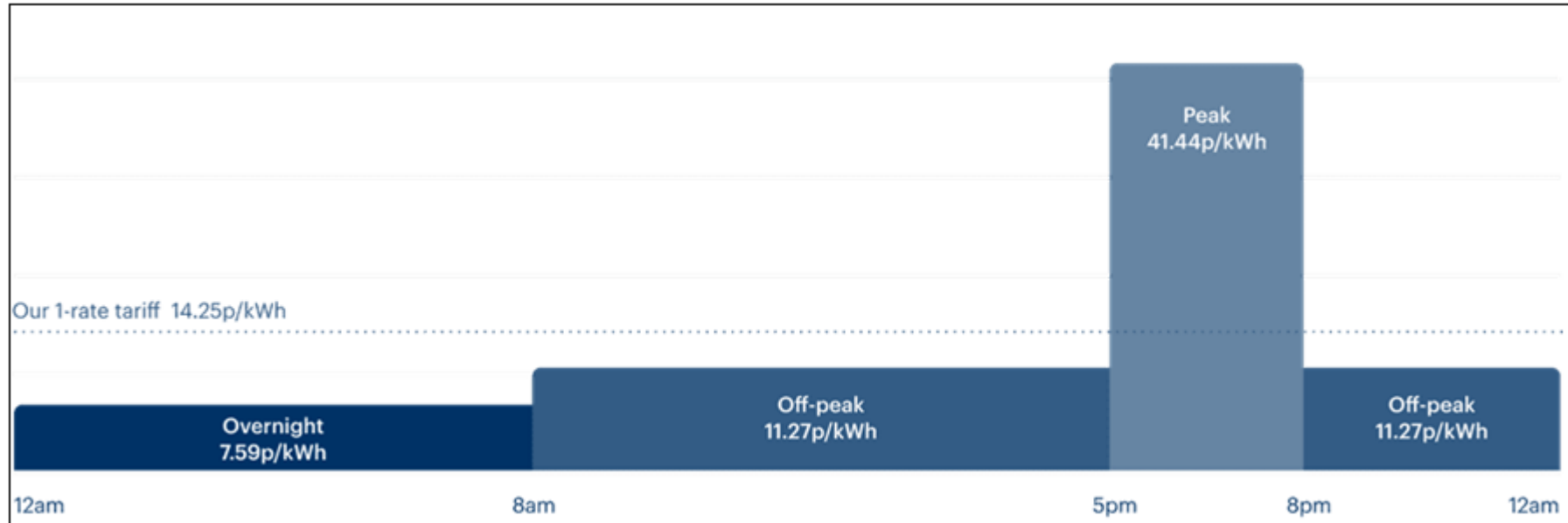


Cost of electricity

Cost of gas

What is the future for the price of electricity ?

- A Decline of Single rate Electricity Tariffs
- A surge in the range of smart tariffs helped by the mass roll out of smart meters



Off peak fares



Peak fares

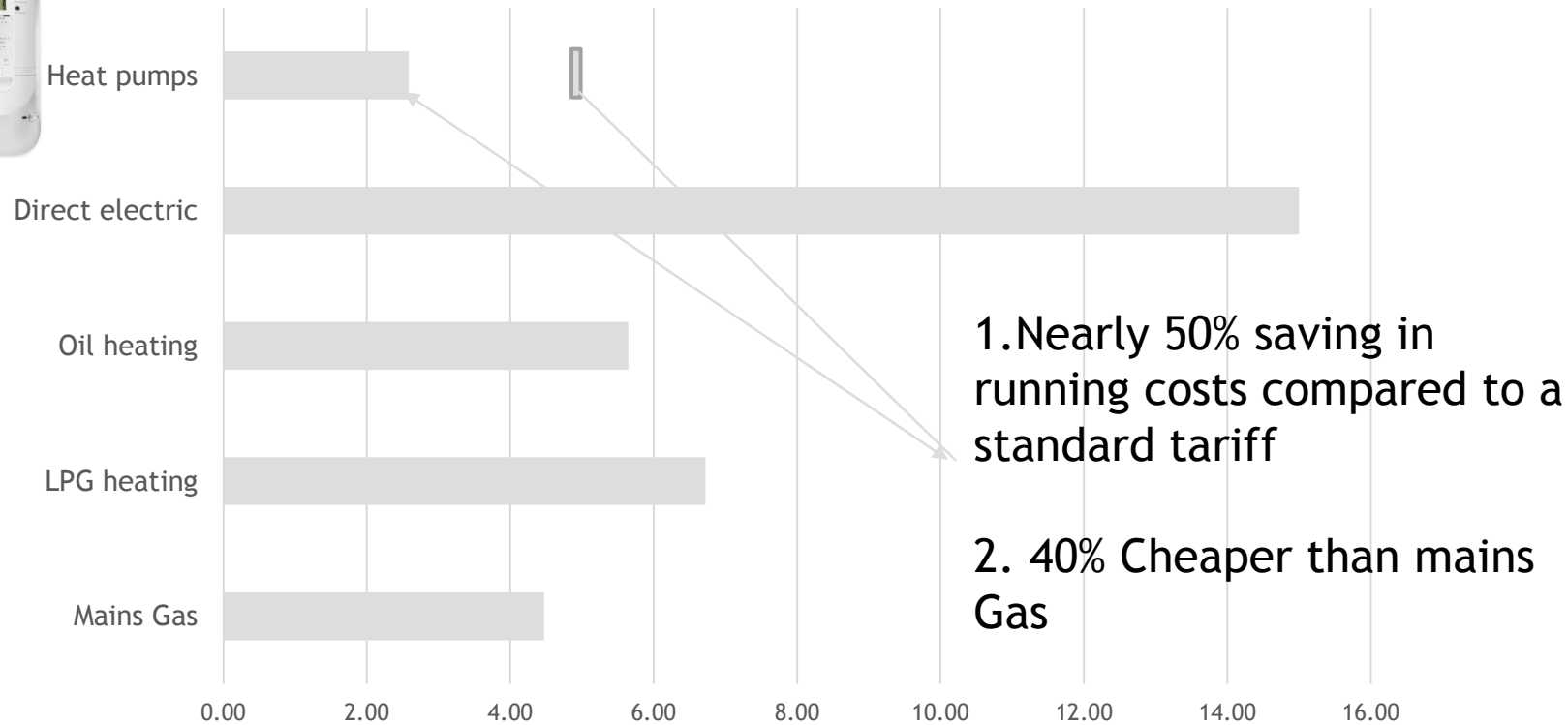
How can heat pumps exploit this new way of buying electricity ?

- Heat pump systems can be designed to generate and store heat with super low rate electricity
- Buffer cylinders can be used as 'heat batteries'
- Underfloor heating systems can be used as 'batteries' to store heat in screed
- New innovative thermal heating batteries can be used to store heat where space is a premium
- heat pumps can be set up 'smart grid enabled'



What affect running heat pumps on smart tariffs has on the running cost?

Running costs of various heating systems



Case Study - Trial of heat pump controlled by a smart tariff



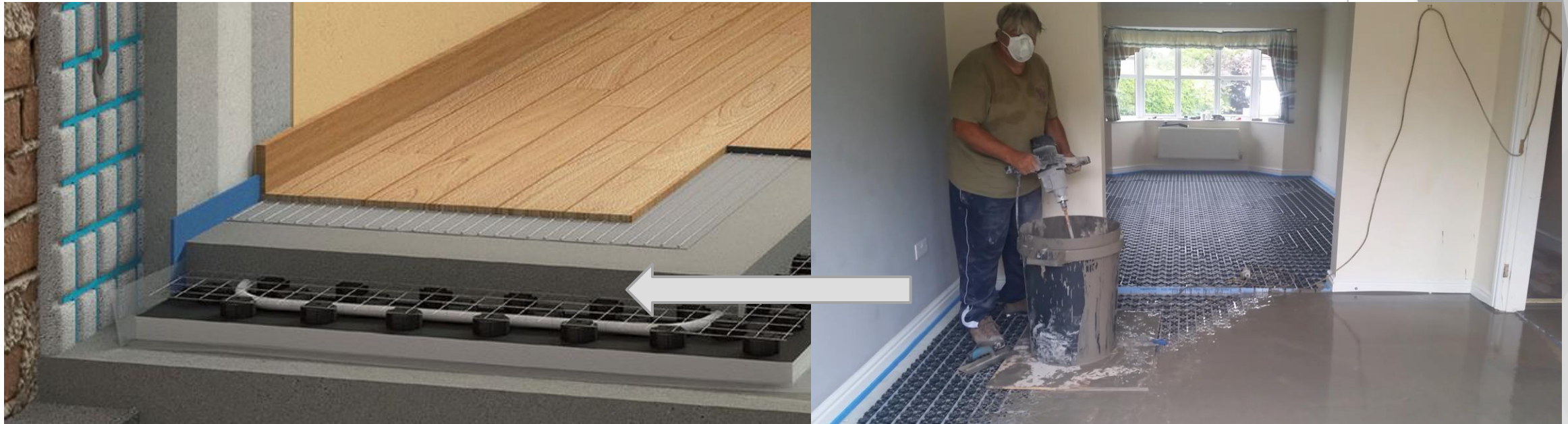
Case Study - Live results - Heat pumps and smart tariffs

- ▶ Heat pump trialled with Octopus Go tariff, 20mm retrofit underfloor heating system using high density resin screed



Case Study - resin screed

- High density resin screed was installed at a thickness of 20mm
- High density screeds mean more heat energy can be stored



Case study - settings of heat pump

- Heat pump charges screed and domestic hot water using 5.5p/kwh for 5 hours from 1:30-6:30
- Heat pump provides further 2 hour boost at 3pm in the afternoon

18th January 2020

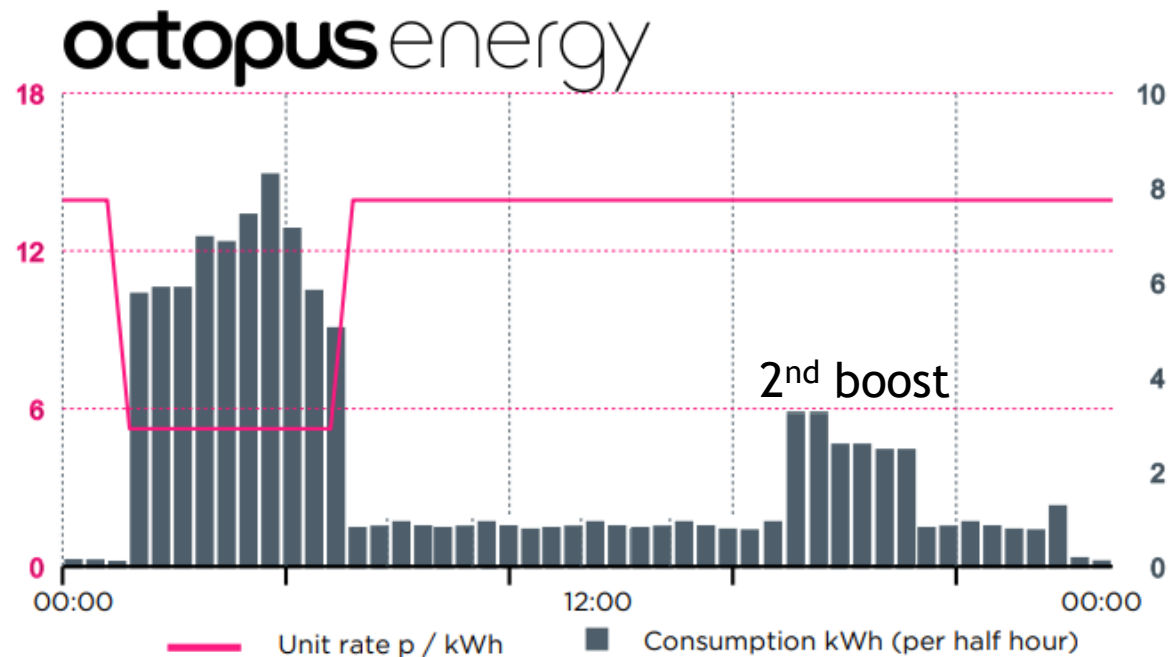
For electricity meter

Total cost

£ 4.39

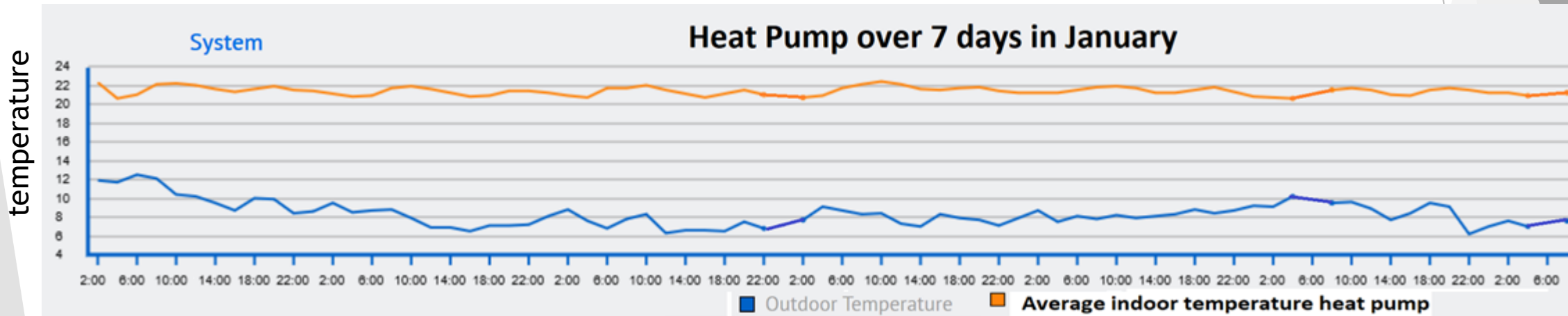
Total consumption

71.98 kWh



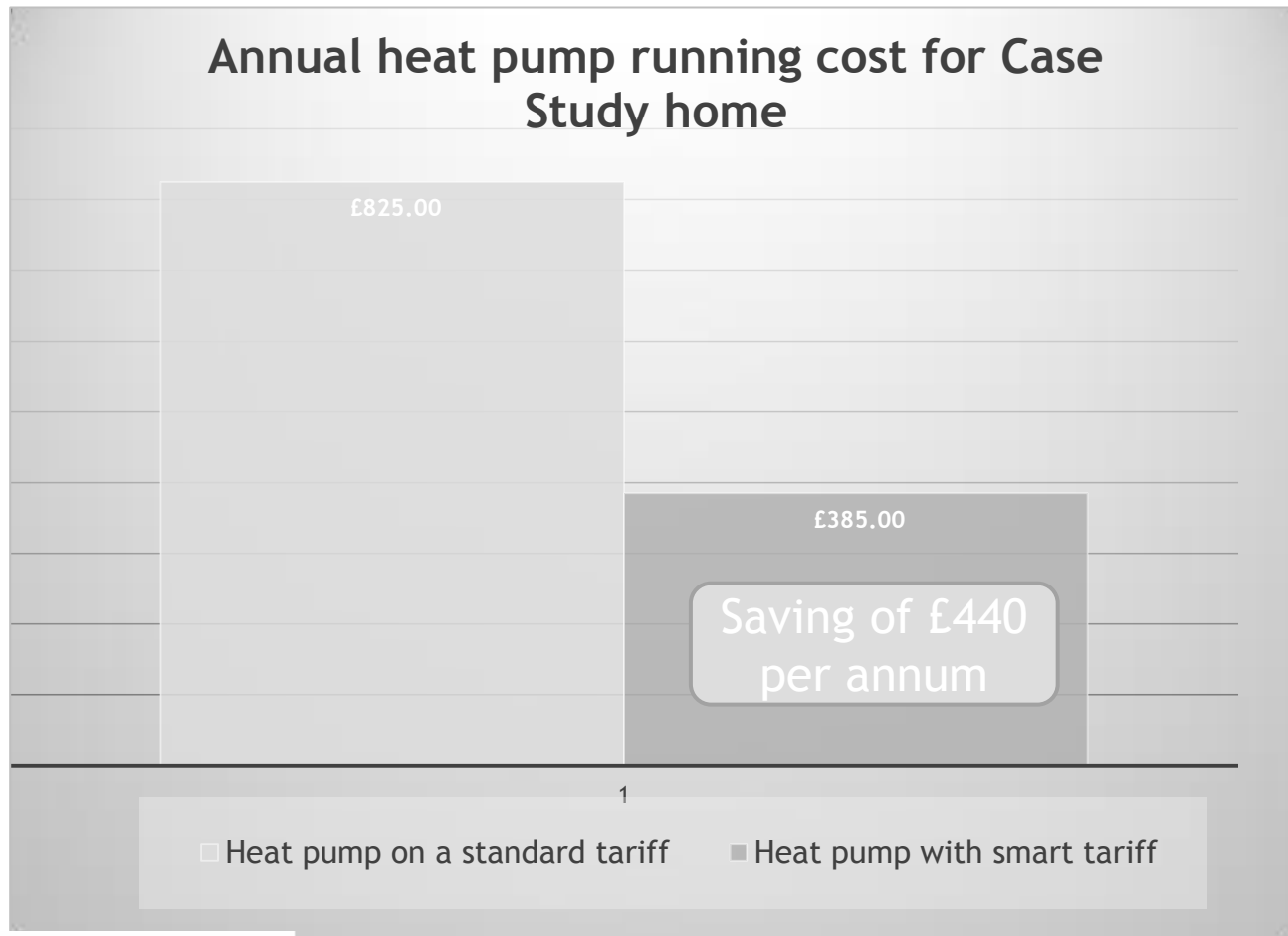
Case Study - comfort in the home

- The comfort temperature in the home was not compromised, temperature always stayed in region of 20-22 degrees
- The screed temperature is heated to approximately 27 degrees at 'heated times'
- Floor sensors are installed to ensure the surface temperature does not exceed 27 degrees.



Case study Running costs over a year

- Heat pump used 5,500 kwh per annum approximately 85% used at super low rate



Your Charges In Detail

Electricity	Supply number	S	1	801	101
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Supply Address:

Octopus Go (13th January 2019 - 10th February 2019)

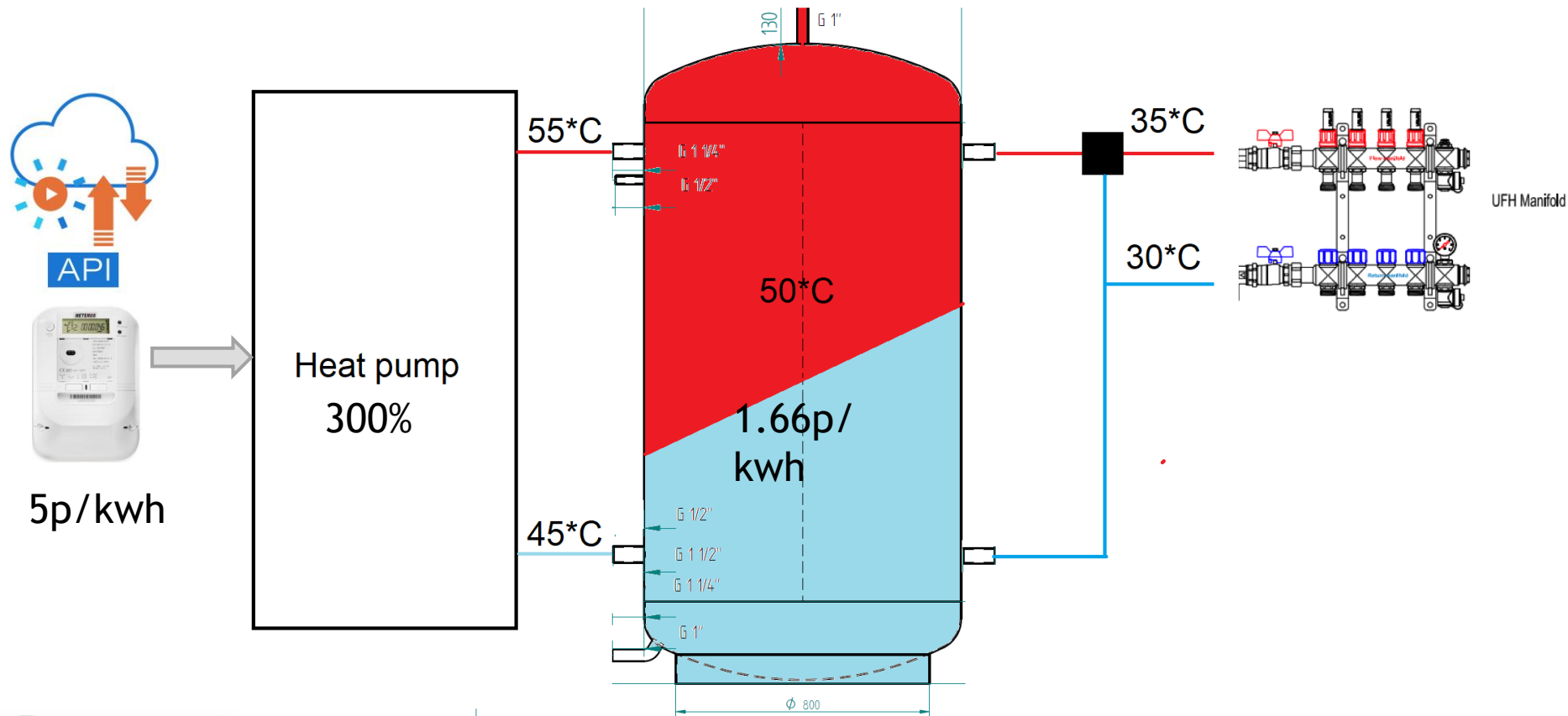
Energy Charges for Meter 17P0456504

13th Jan. 2019	5543.0 Smart meter reading	
11th Feb. 2019	6903.5 Smart meter reading	
Energy Used	1360.6 kWh @ 6.51p/kWh†	£88.59
Standing Charge	29 days @ 23.81p/day	£6.90
Subtotal of charges before VAT		£95.50
VAT @ 5.00%		£4.78
Total Electricity Charges		£100.28

Total charges for bill £100.28

The use of buffer cylinders

- Oversizing buffer cylinders can be a low cost way to store heat
- Careful design is required to maximise savings



$$5/3=1.66$$

Use of thermal batteries

- Thermal batteries use Phase Change Materials (PCMs) to store heat for hot water and space heating in buildings
- Can be charged up from heat pumps using smart tariffs

Advantages

- Low standing heat losses
- Extremely compact compared to storing heat in water

Disadvantages

- Higher cost



Phase change materials

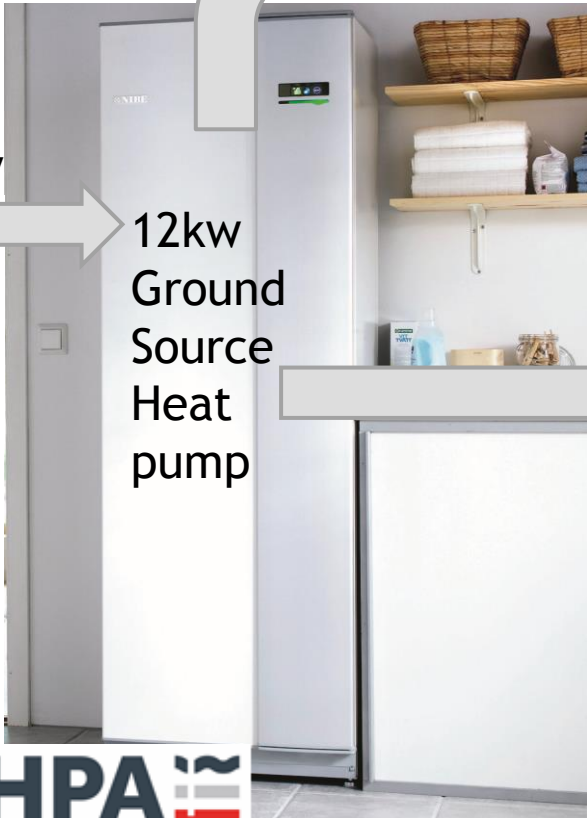
A combination of buffer cylinders and screed

50kwh average
daily space
heat peak load

Low cost
electricity



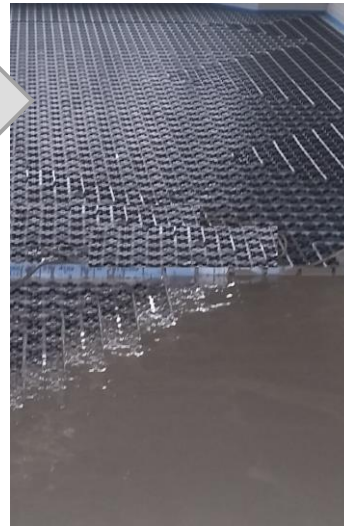
12kw
Ground
Source
Heat
pump



GSHPA
GROUND SOURCE HEAT PUMP ASSOCIATION

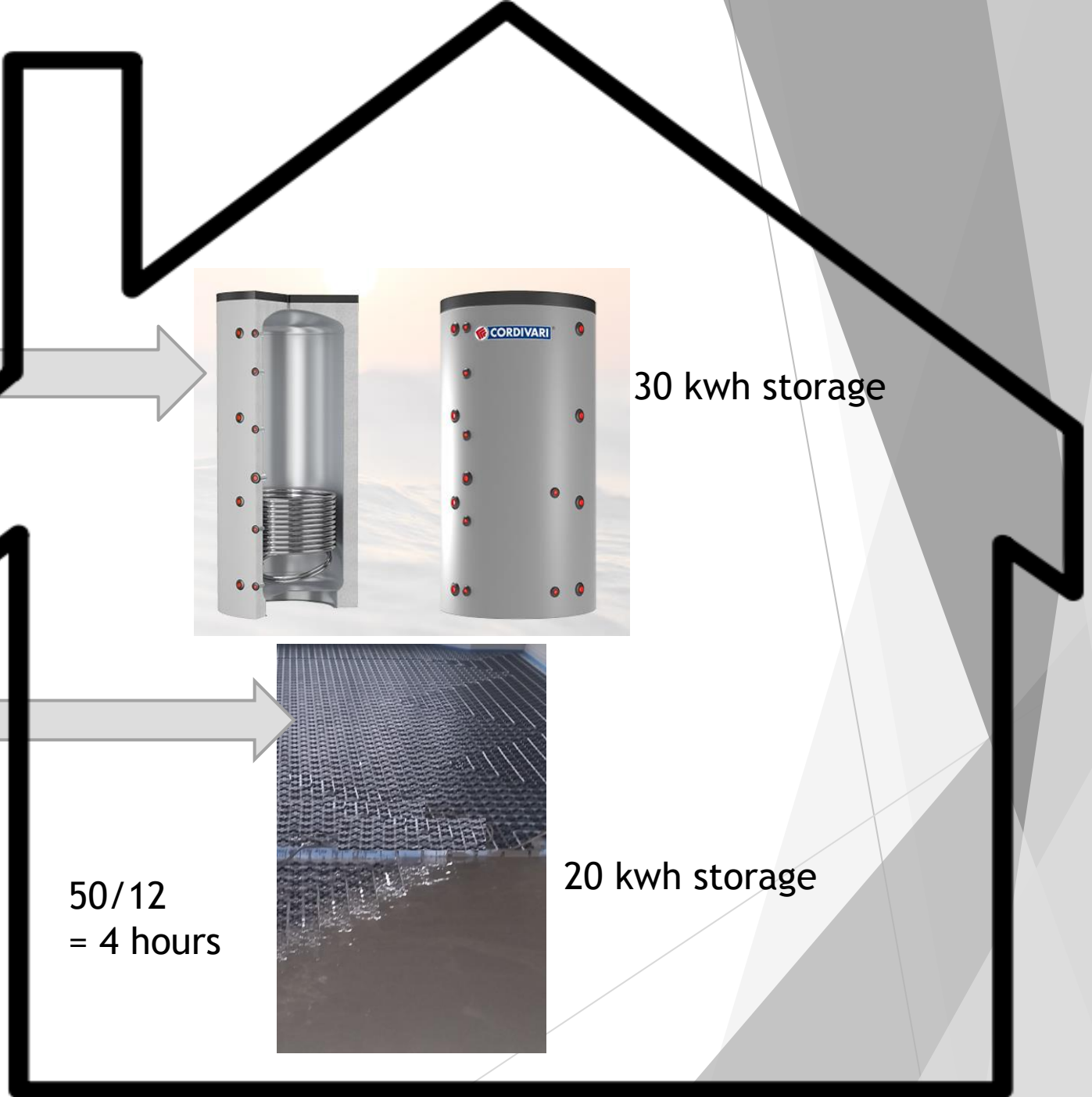


30 kwh storage



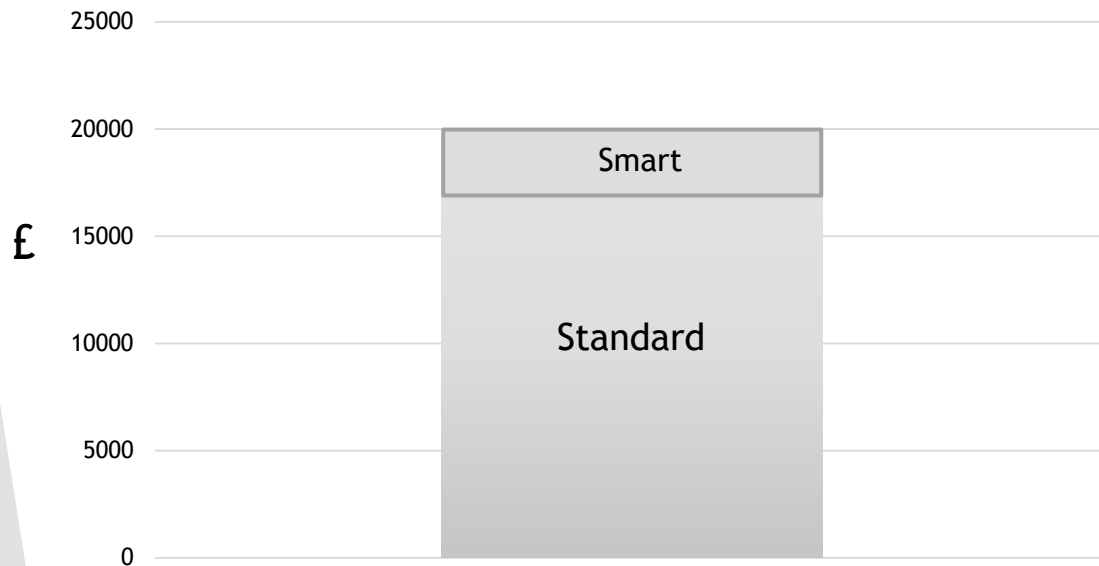
20 kwh storage

$50/12$
= 4 hours



Smart heat pump - Smart Investment?

Installation Cost of a ground source heat pump



- Average extra initial cost of enabling a smart heat pump £3,000
- Savings found in case study £440 per year
- £11,000 saving in running costs over a 25 year lifetime of the system
- Profit of **£8,000** from running on smart tariffs alone

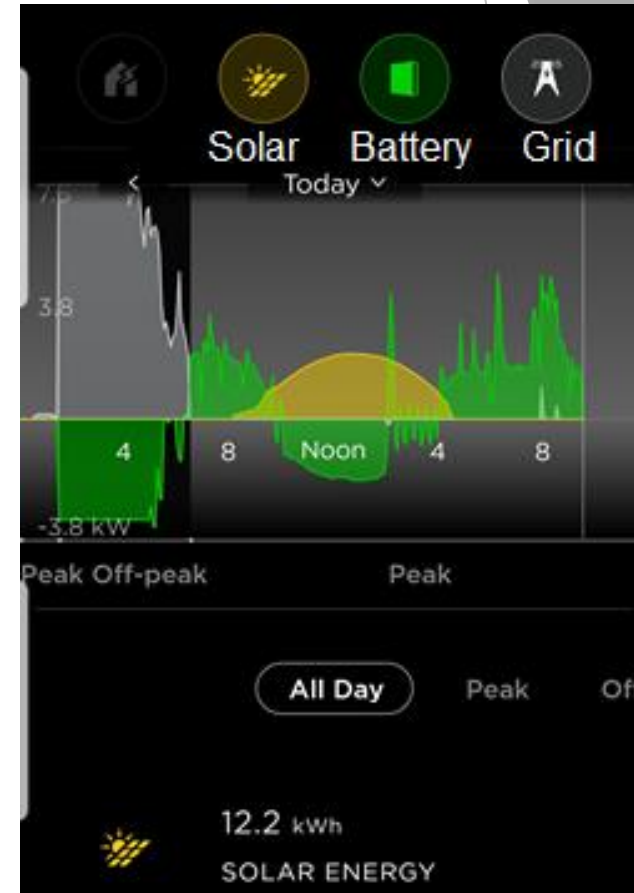
Once you have designed a smart ready heat pump the benefits are endless:

- ▶ Benefit from lower running costs
- ▶ Integrates other technologies such as battery storage and solar energy to further reduce running costs
- ▶ Benefit and earn an income through negative energy prices
- ▶ Earn potential revenue through Demand Side Response

Thanks for joining The Big Switch On.

We're all set — your half-hourly readings are feeding through automatically from your smart meter, so all you need to do now is make the most of it!

As a reminder, you'll be **paid 5p / kWh** for every unit of electricity you use between 05:00 and 07:00 tomorrow morning.

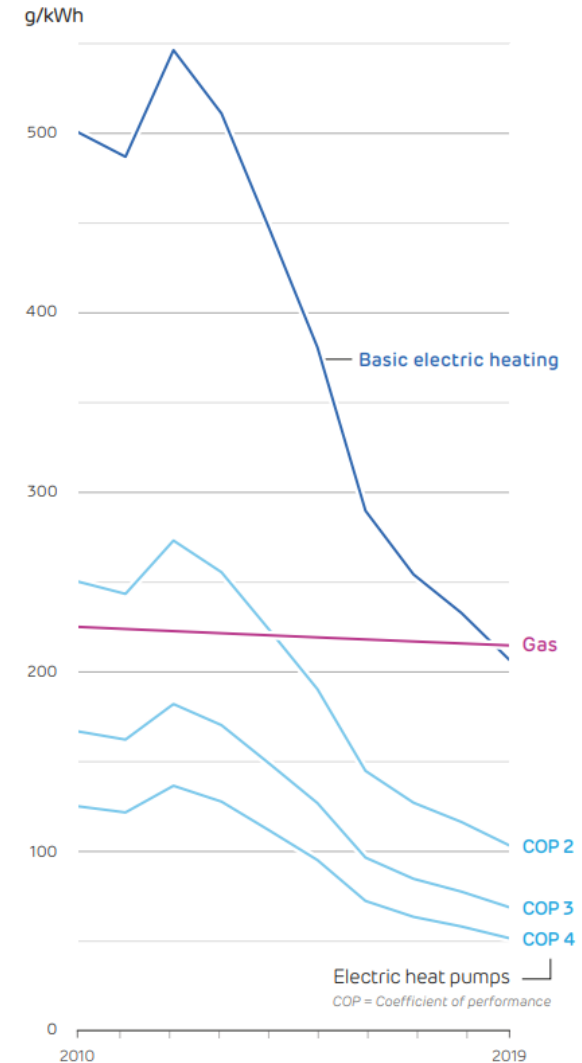


A Smart heat pump is positive for the environment

- Heat pumps emit the lowest carbon emissions compared to any other heating system
- A smart heat pump can help stabilise the grid
- A Smart heat pump can ensure that that the grid can operate efficiently by switching on in days of high generation/low demand



The carbon intensity of heat produced from gas and electricity, based on the UK average gas boiler mix, and average generation mix



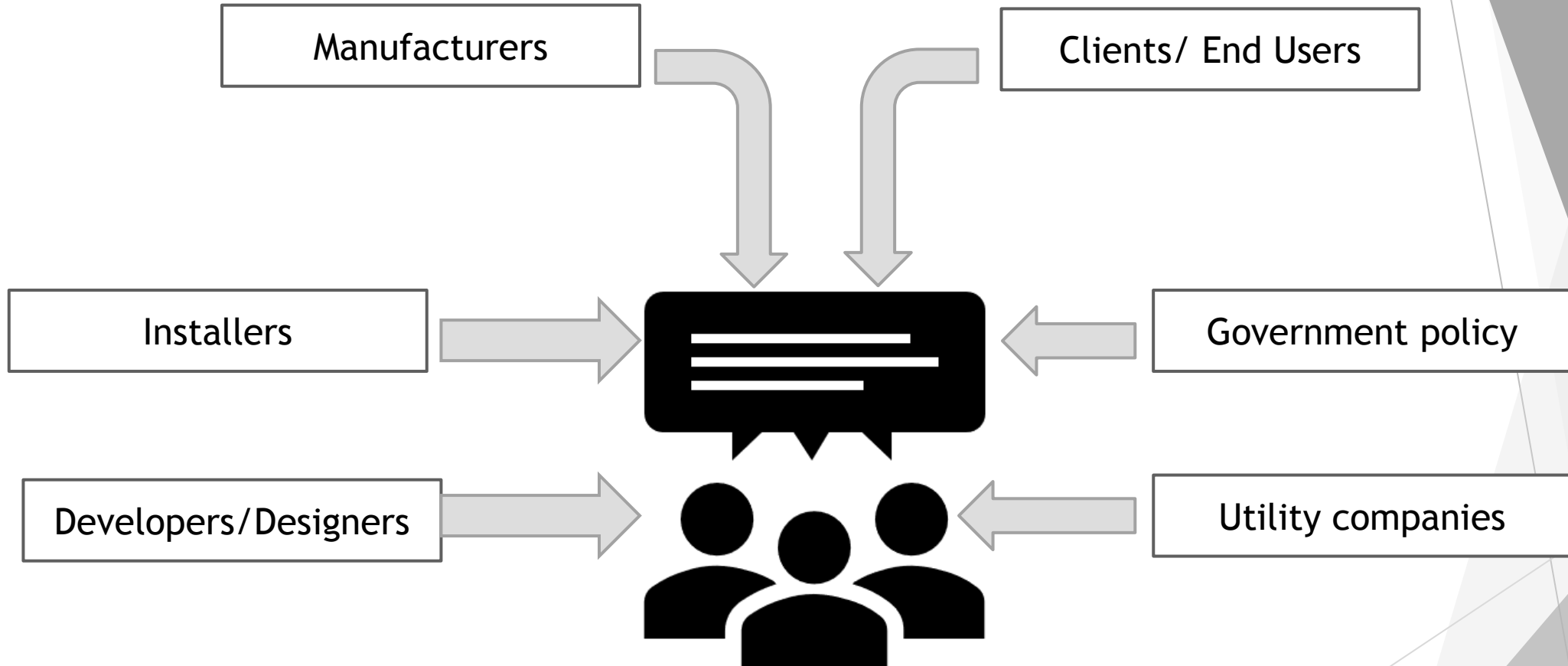
Tried and tested technology

- Storage heaters have been around for 50 years doing exactly the same thing
- Economy 7 tariffs historically gave half price electricity at night to charge storage heaters
- Promoted in the 1970s and 1980s so coal power stations could be kept on overnight



How can smart heat pumps roll out mainstream?

- Joint effort required



Questions.....

and thank you
www.gshp.org.uk

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