GROUND SOURCE HEAT PUMPS AND SHARED GROUND LOOP ARRAYS

Kensa Contracting
A KENSA GROUP COMPANY

The UK's leading ground source heat pump manufacturer and installation contractor

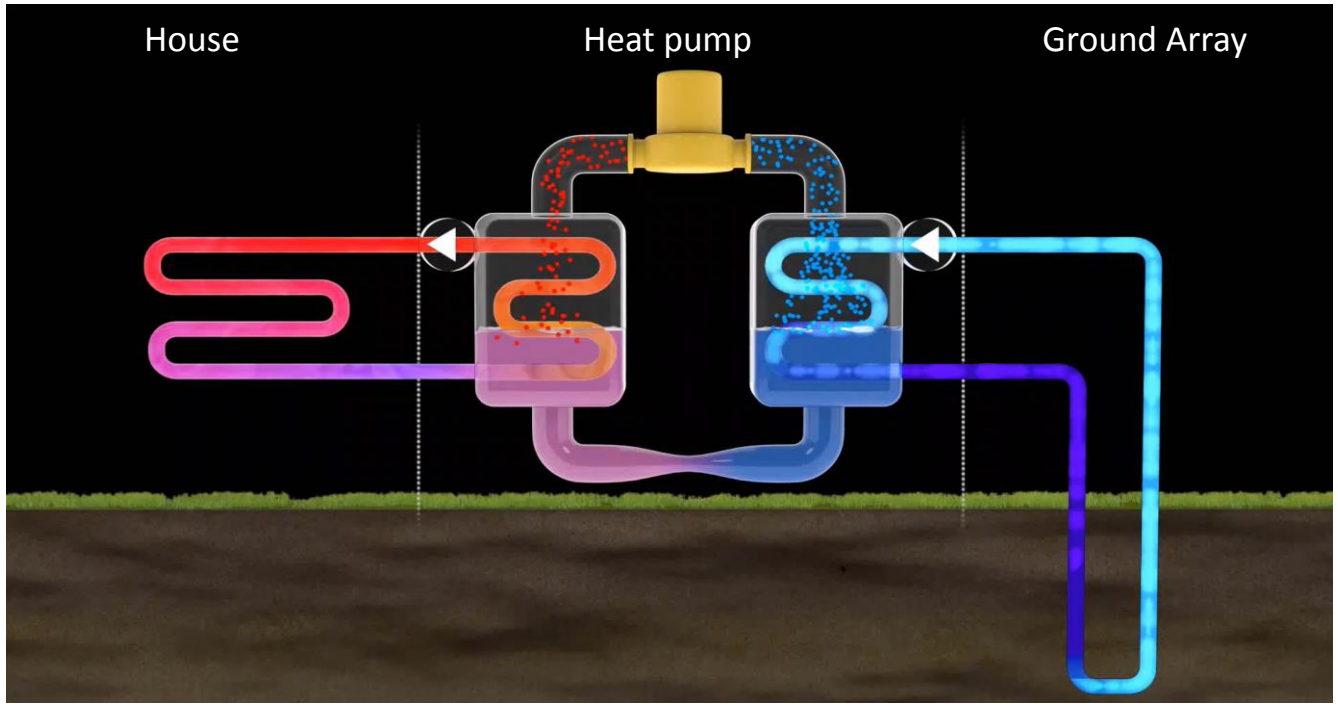
CONTENTS


Kensa Group
Kensa Heat Pumps
A KENSA GROUP COMPANY
Kensa Contracting
A KENSA GROUP COMPANY
Kensa Utilities
A KENSA GROUP COMPANY

HOW A GSHP WORKS

The basics:

- Non combustion heating system
- Produces up to three times more energy than it consumes
- Ground provides a highly efficient source of heat
- Unaffected by air temperature
- Recharged by solar energy and rainfall
- Ground type (thermal conductivity) needs to be factored into sizing calculations
- Correct sizing is important to avoid over extract



https://www.kensaheatpumps.com/how-a-ground-source-heat-pump-works/

GSHP BENEFITS

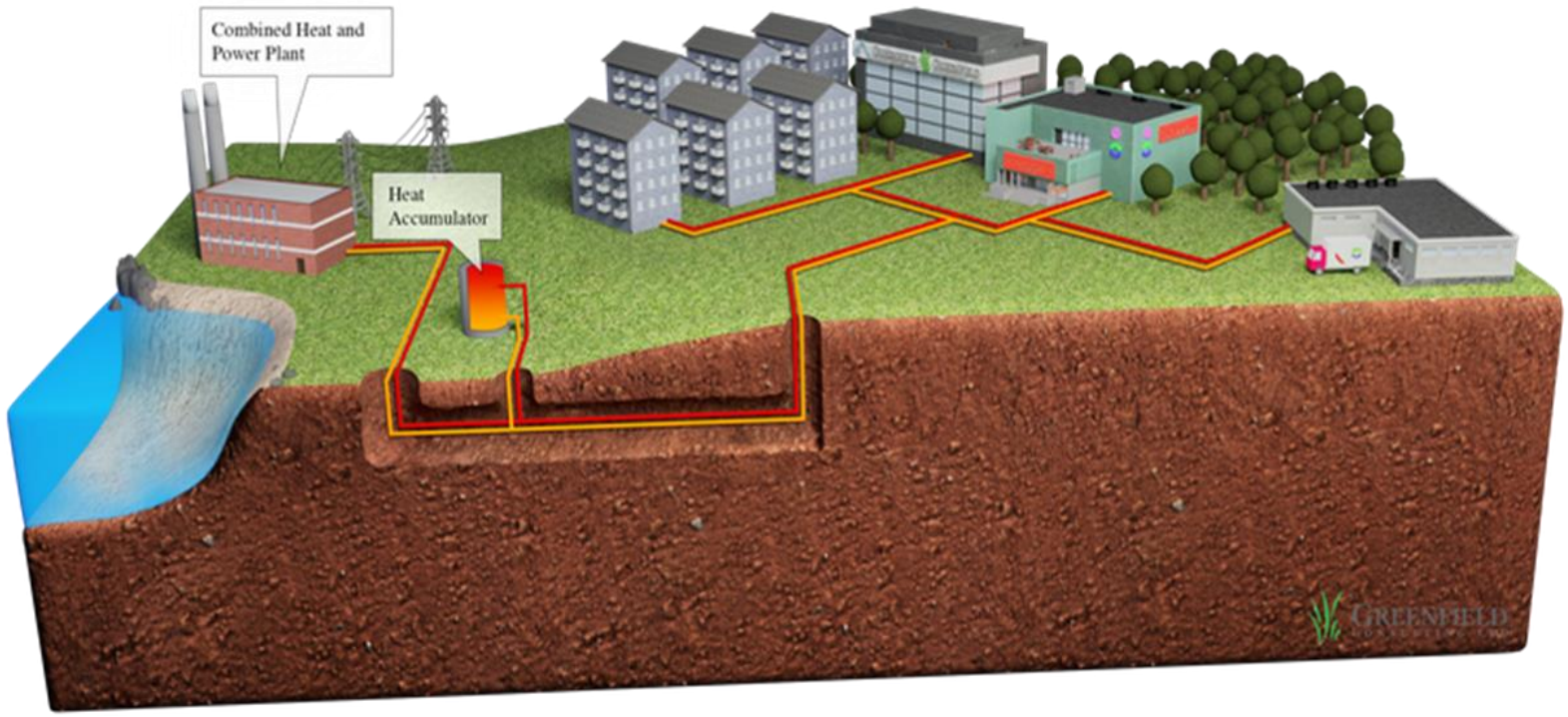
In brief:

- Extremely low CO_2 emissions enabling easy carbon and building regulations compliance
- No point of use NOx or SOx emissions
- Lowest energy bills; slightly lower than air source heat pumps, LPG & oil
- Ultra-efficient and reliable
- Minimal service and maintenance costs
- 20 – 25 year heat pump unit life expectancy
- >100 year ground array life expectancy
- Ideally suited for time of use tariffs
- Completely unobtrusive – no visual impact

TRADITIONAL DISTRICT HEATING

Drawbacks:

- Heat loss through network
- Overheating in risers & corridors
- Networked heat metering
- Requires split-billing
- Single heat energy provider
- Complex funding claims
- Large & unsightly central plant
- ESCO purchases energy
- Highly specialised servicing
- Back up system required

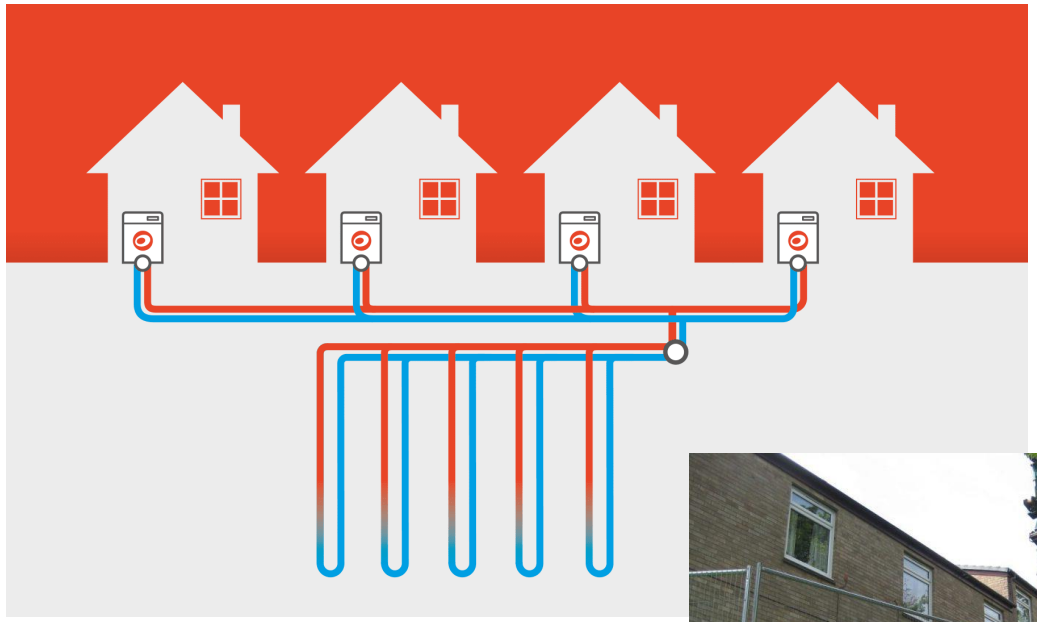


SHARED GROUND LOOP ARRAYS

Shared ground loop arrays are a form of ultra-low temperature heat network connecting Kensa ground source heat pumps inside individual dwellings.

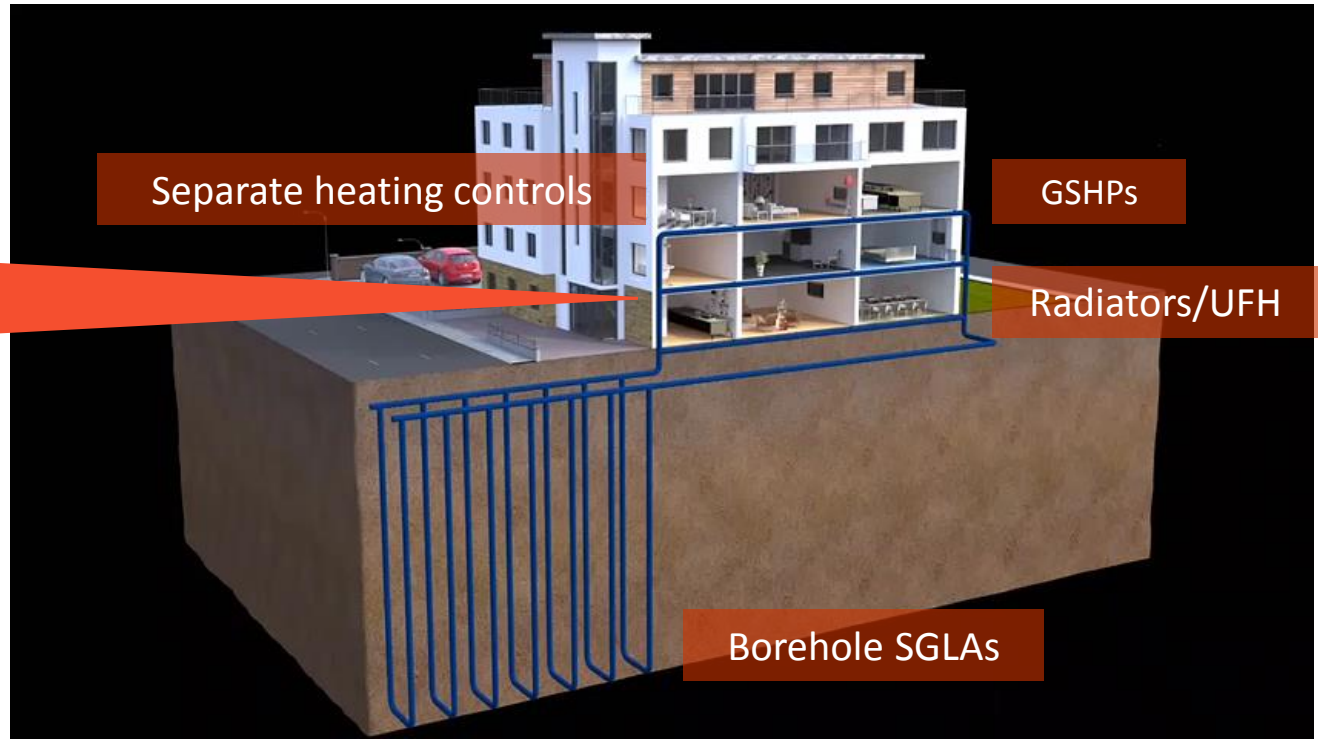
A different approach:

- Link as few as two properties
- Infinitely scalable for large developments
- Suitable for single and multiple occupancy dwellings
- Communal ground array pipework
- Individual heat pump in each dwelling
- Mimics a traditional gas framework



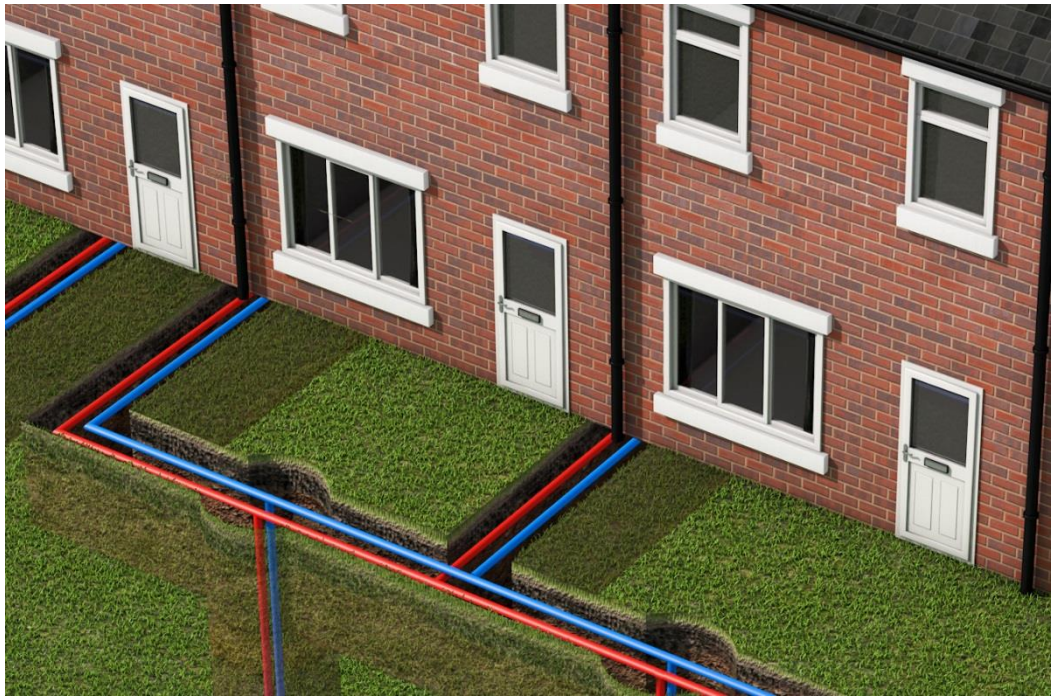
https://www.kensaheatpumps.com/the-technology/heat-sources-collectors/shared-ground-loop-arrays/

An individual Kensa heat pump inside each dwelling provides independently controllable heat and hot water for each property.



SGLA BENEFITS

- Ambient temperature distribution
- No district heat losses and no overheating
- Potential for free summer cooling
- Powered from occupants own electricity supply
- Householders able to switch energy suppliers
- Lowest running costs
- Independent billing and independent heat
- Eligible for 20 years payback from the Non Domestic RHI
- Split ownership permitted
- Ground arrays 100> year lifetime
- Planning exempt



KENSA'S SHOEBOX HEAT PUMP

A perfect fit for Shared Ground Loop Arrays:

- 3kW and 6kW models
- Quiet operation: 47 dBA and 52 dBA
- Compact design: 530mm x 475mm x 370mm
- or 560mm x 605mm x 565mm (H x W x D)
- Integrated ground side circulation pump
- Heating and hot water (above 60°C)
- Fits in a cupboard or under a sink
- Compatible with all control systems

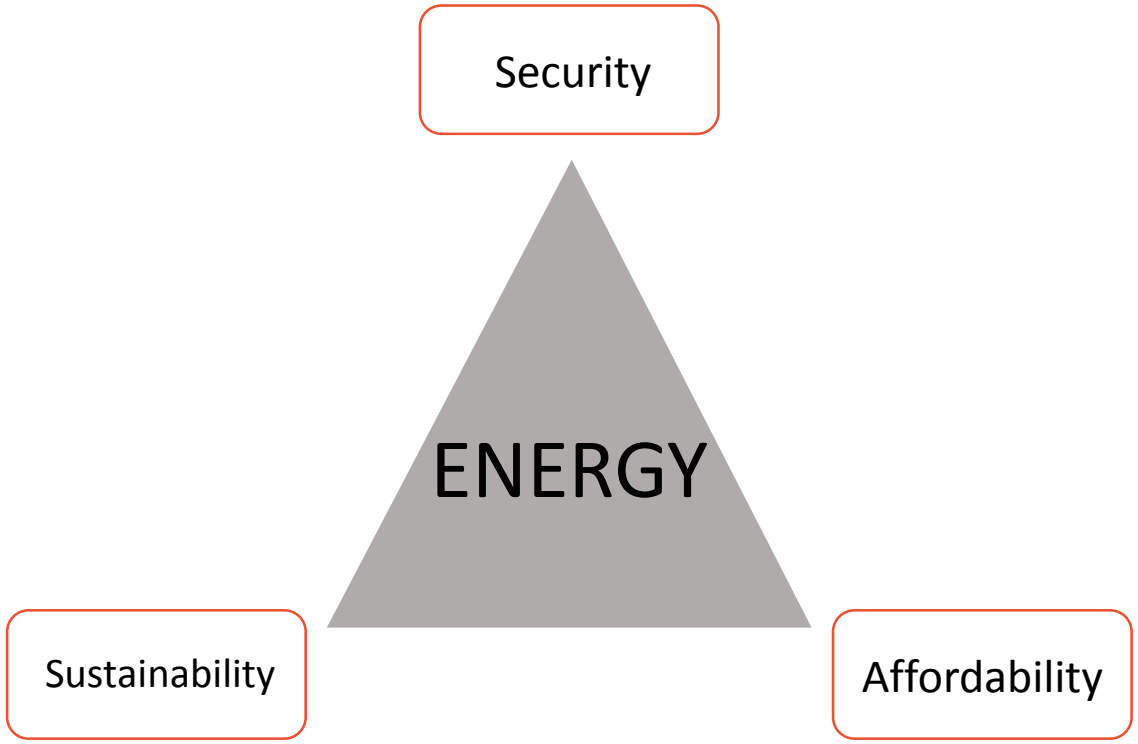
https://www.kensaheatpumps.com/ground-source-heat-pump-products-services/shoebox-ground-source-heat-pump/

THE UK ENERGY TRILEMA

Transitioning to low/zero carbon heating is vital in meeting the UK's obligations for carbon reduction.

- Security – reliance on imported energy
- Sustainability – finite resource requiring industry uses to halt production
- Affordability – gas price went up by 74%

The electrification of heat is a key element of Government's strategy for dealing with these issues, and heat pumps will make up a significant part of the solution.



Technology	Carbon Intensity of Fuel ($kgCO_2e/kWh$)*	System efficiency	Carbon Intensity of Heat ($kgCO_2e/kWh$)	Annual Carbon Emissions ($kgCO_2e$) 5,000 kWh annual heat demand
GSHP	0.233	300%	0.078	390
ASHP	0.233	230%	0.101	505
Oil Boiler	0.298	85%	0.351	1,755
LPG Boiler	0.241	85%	0.284	1,420
Night Storage Heaters	0.233	100%	0.233	1,165
Mains Gas Boiler	0.210	85%	0.247	1,235

*Source – SAP10.0 (24/07/18)

CLEAN GROWTH STRATEGY

GSHP's & GOVERNMENT

"By 2050, we will…likely need to fully decarbonise how we heat our homes.

There are a number of low carbon heating technologies with the potential to support the scale of change needed, including ***heat pumps…"***

"Ahead of these decisions, we can take further action to reduce emissions from heating the 850,000 homes currently not connected to the gas grid in England and that use oil for heating.

"We also need to avoid new homes needing to be retrofitted later and ensure that they can all accommodate low carbon heating. This could involve ***all new homes off the gas grid from the mid-2020s being heated by a low carbon system, such as a heat pump.***"

- CLEAN GROWTH STRATEGY – OCTOBER 2017

*"The commitment to **phase out the installation of high carbon fossil fuel heating in buildings off the gas grid** is welcome. This should include **heat pump deployment**, which, together with installation in new-build properties, would develop heat pump markets and supply chains in order to prepare, if necessary, for potential widespread deployment in buildings connected to the gas grid from the 2030s.*

*"Deployment of **2.5m heat pumps is likely to be the minimum necessary by 2030**…In our scenarios, these 2.5 million are split evenly between properties off the gas grid and new-build properties."*

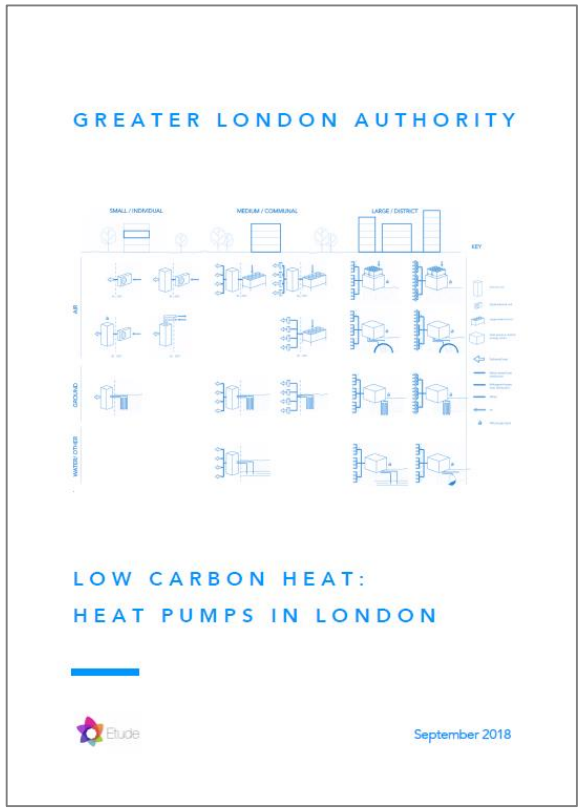
- CCC RESPONSE TO THE CLEAN GROWTH STRATEGY

Committee on Climate Change

GREATER LONDON AUTHORITY

GSHP's & GOVERNMENT

- London aims to be a zero-carbon city by 2050
- GLA commissioned major report on viability of heat pumps for London
- The report concludes that efficient heat pumps offer a cost competitive form of low carbon heating
- Heat pumps are very likely to play a growing role for the delivery of low carbon heat in the capital
- Staging seminars to support the roll-out of heat pumps in new builds



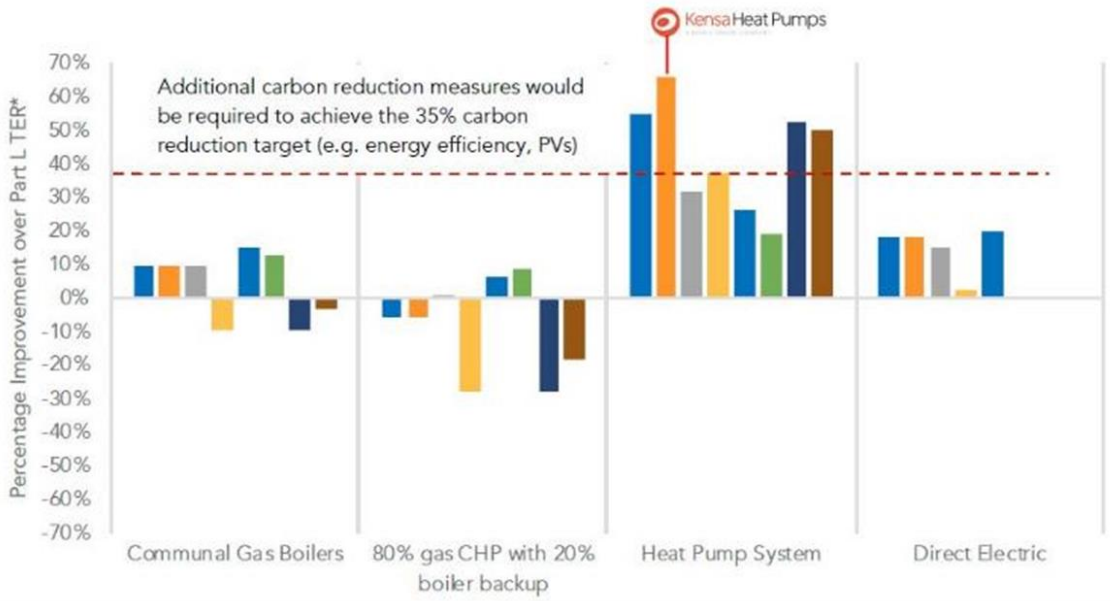
> **Heat pump systems** provide the lowest carbon heat for all case studies, though significant differences exist between the various types of heat pump. The lowest carbon heat is achieved by the residential block using ground source heat pumps coupled to a communal ground loop. This system benefits from very small distribution losses due to the ambient flow temperature and relatively high efficiencies of 380% for space heating at 35°C and 290% for DHW at 60°C offered by ground source heat pumps.

Kensa Contracting
A KENSA GROUP COMPANY

Barely compliant:

- The proposed SAP10 carbon factors will drive interest in ground source heat pumps
- If housebuilders continue to elect to build barely compliant homes, there will be opportunities to reduce money from other elements of the build
- Analysis performed by AES Sustainability Consultants using the current SAP factors suggested these savings would be at least £1500
    - These savings would likely be enhanced under SAP10

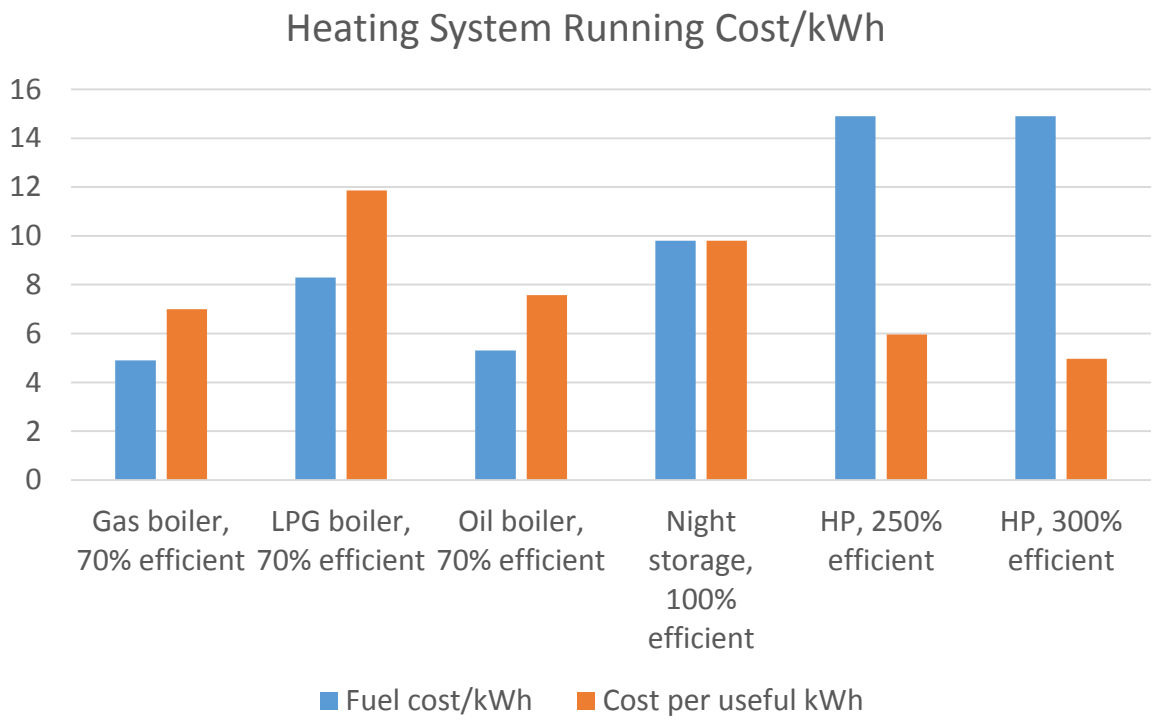
SAP10 comparison of Part L improvement results (assuming a carbon factor of 233gCO2 /kWh for electricity).



Source: Etude, 'Low Carbon Heat: Heat Pumps In London', September 2018.

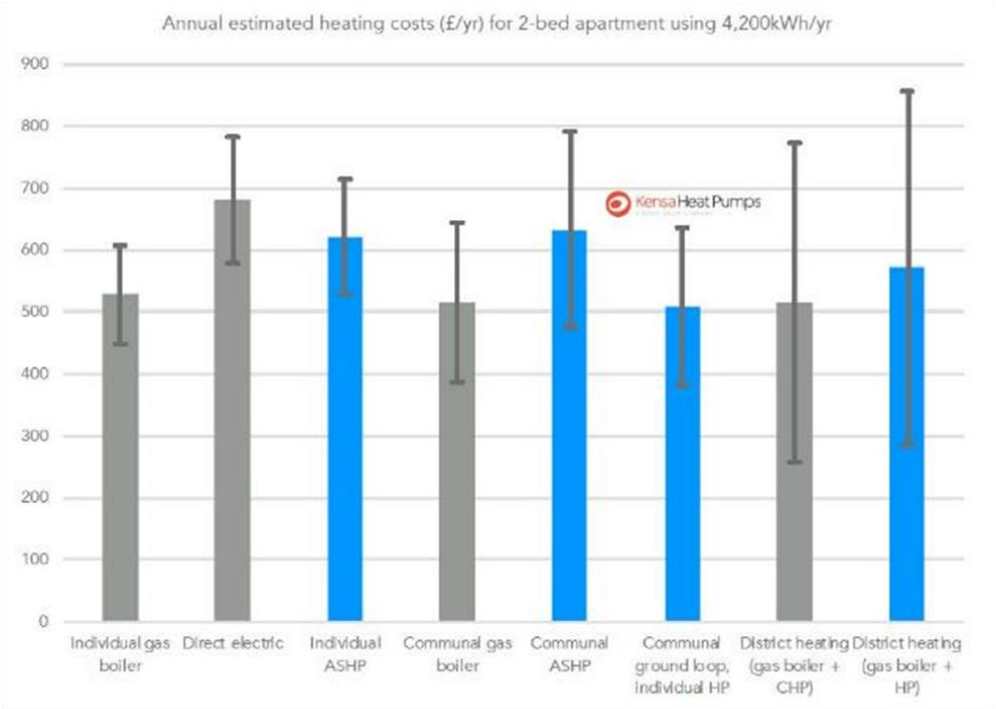
RUNNING COST SAVINGS

Unit cost



Annual cost

Comparison of predicted heating costs for the resident(s) of a 2-bed energy efficient apartment



Source: Etude, 'Low Carbon Heat: Heat Pumps In London', September 2018.

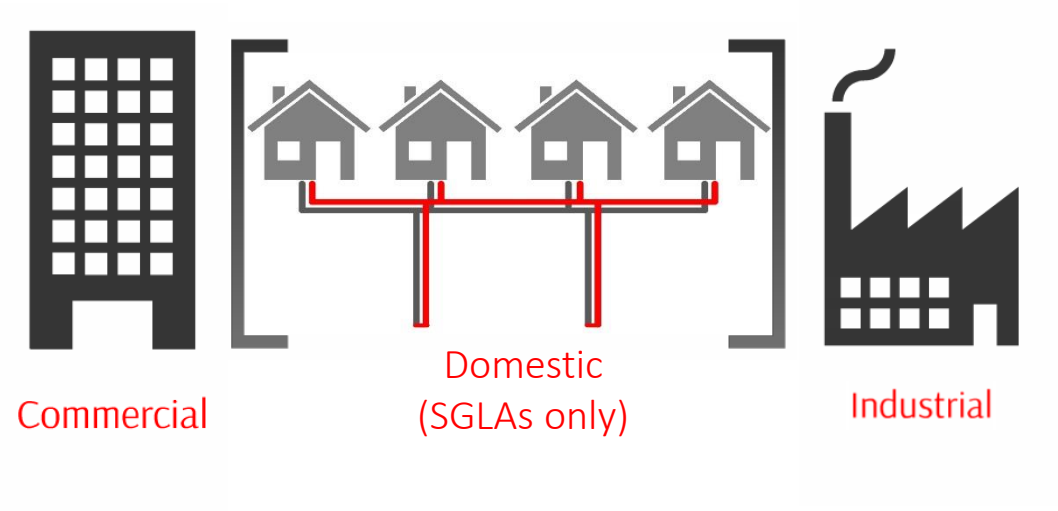
NON DOMESTIC RHI

In brief:

- Intended for commercial applications or district heating
- Guaranteed payments for **20 years**
- Current tariff:
  - **9.56 p/kWh** (first 1314 run hours)
  - e.g. 5000kWh property generates a Year One income of £478
  - **2.85 p/kWh** (remaining run hours)
- Both retrofit and new build are eligible

Shared Ground Loop Arrays:

Significantly for housebuilders and social housing providers, SGLAs are classed as residential district heating, and therefore **eligible for the Non Domestic RHI.**



THE DUNES – NEW BUILD FLATS

COSTED EXAMPLE

In brief:

- New build, phased installation
- 27 flats, 9 houses
- Each dwelling has its own Kensa Shoebox heat pump
- Heat pump and cylinder fit in airing cupboards
- 4 shared ground loop arrays
- 17 boreholes, 95-130m deep
- £146,000 ground array cost
- £368,000 RHI return
- 13.7 tCO_2 saving/yr

ENFIELD COUNCIL – RETROFIT, FLATS

In brief:

- Retrofit project
- 402 flats
- 8 tower blocks, 13 storey
- 96 boreholes
- 212m typical borehole depth
- £4.8 million project
- £4.3 million RHI return
- 773 tCO_2 saving/yr
- Running costs for residents reduced from £900/yr to £350/yr

GROUND SOURCE HEAT PUMPS AND SHARED GROUND LOOP ARRAYS

Conclusions

- The technology is well developed and has been deployed at scale
- Government funding for shared ground loop heat pumps is in place to stimulate significant growth
- Investment returns on shared ground loops are attractive both in return rates and potential volumes
- Kensa has the knowledge and expertise to deploy this technology at significantly increased scale
- GSHP are a sustainable heating solution for both new build and retrofit projects

CONTACT DETAILS

Come and visit me on STAND 24

Dr. Stuart Gadsden

Technical Sales Manager, East

Kensa Contracting Limited

stuart.gadsden@thekensagroup.com

Tel. 01872 862140 | Mob. 0750 800 5541

www.kensaheatpumps.com

Accreditations

Kensa Contracting
A KENSA GROUP COMPANY