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## GROUND SOURCE HEAT PUMPS AND SHARED GROUND LOOP ARRAYS

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# INTRODUCING KENSA



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

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GROUP STRUCTURE

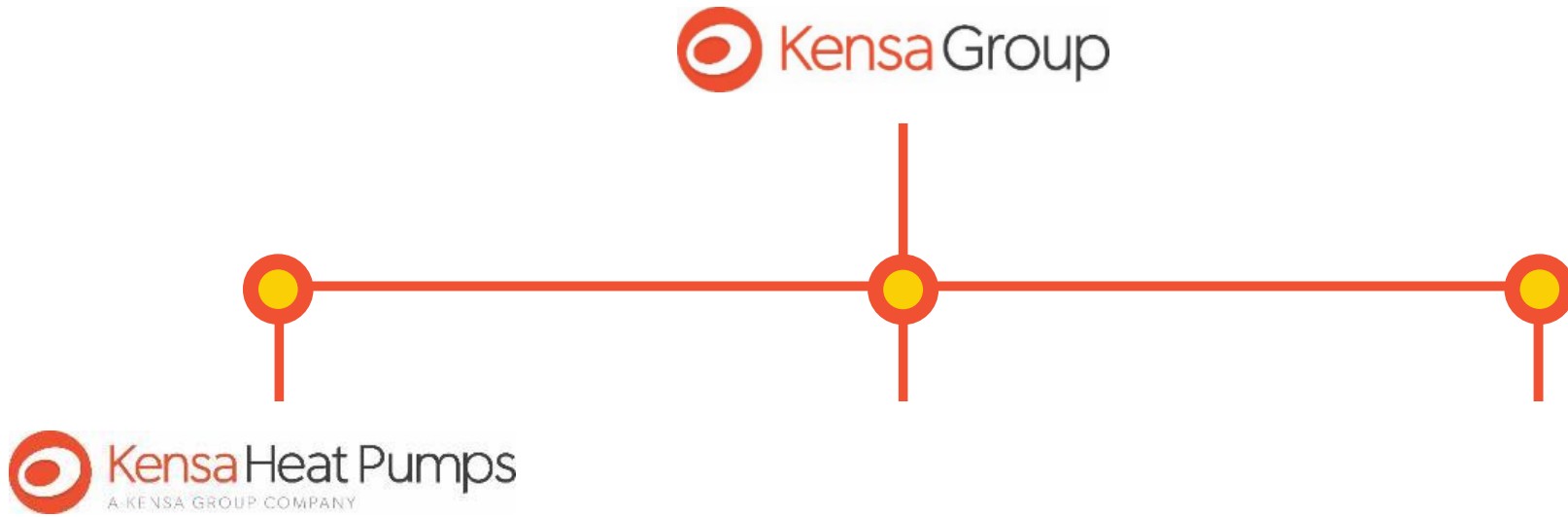
INTRODUCING KENSA



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GROUP STRUCTURE

INTRODUCING KENSA



# KENSA HEAT PUMPS

# INTRODUCING KENSA

- UK market leader
- Established 1999
- UK's only GSHP manufacturer
- Based in Cornwall & Devon
- Single technology solution provider
- Industry accredited
- 5000+ Kensa GSHPs in use
- Award winning

	2011	2012	2013	2014	2015	2016	2017
IVT	16-20%	Kensa 21-25%	Kensa 16-20%	Kensa 21-25%	Kensa 26-30%	Kensa 31-35%	Kensa 31-35%
Nibe	16-20%	IVT 16-20%	Nibe 11-15%	Nibe 16-20%	Nibe 21-25%	Nibe 16-20%	Nibe 21-25%
Kensa	6-10%	Nibe 6-10%	IVT 11-15%	IVT 11-15%	Vaillant 6-10%	Vaillant 6-10%	Stiebel Eltron 11-15%
Danfoss	6-10%	Danfoss 6-10%	Dimple x 6-10%	Dimple x 6-10%	Danfoss 6-10%	Neura 6-10%	Vaillant 6-10%
Dimple x	6-10%	Dimple x 6-10%	Danfoss 6-10%	Danfoss 6-10%	IVT 6-10%	Stiebel Eltron 6-10%	Mastert herm 6-10%
Bosch	6-10%	Bosch 1-5%	Steibel Eltron 6-10%	Vaillant 6-10%	Dimple x 1-5%	IVT 6-10%	Others 16-20%
Calorex	6-10%	NuTherm 1-5%	Vaillant 1-5%	Steibel Eltron 1-5%	Steibel Eltron 1-5%	Danfoss 1-5%	

UK Heat Pump Market Shares. Source: BSRIA (2011—2018)





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# KENSA CONTRACTING

# INTRODUCING KENSA

Kensa Contracting has an award-winning heritage with thousands of successful installations in both retrofit and new build properties.

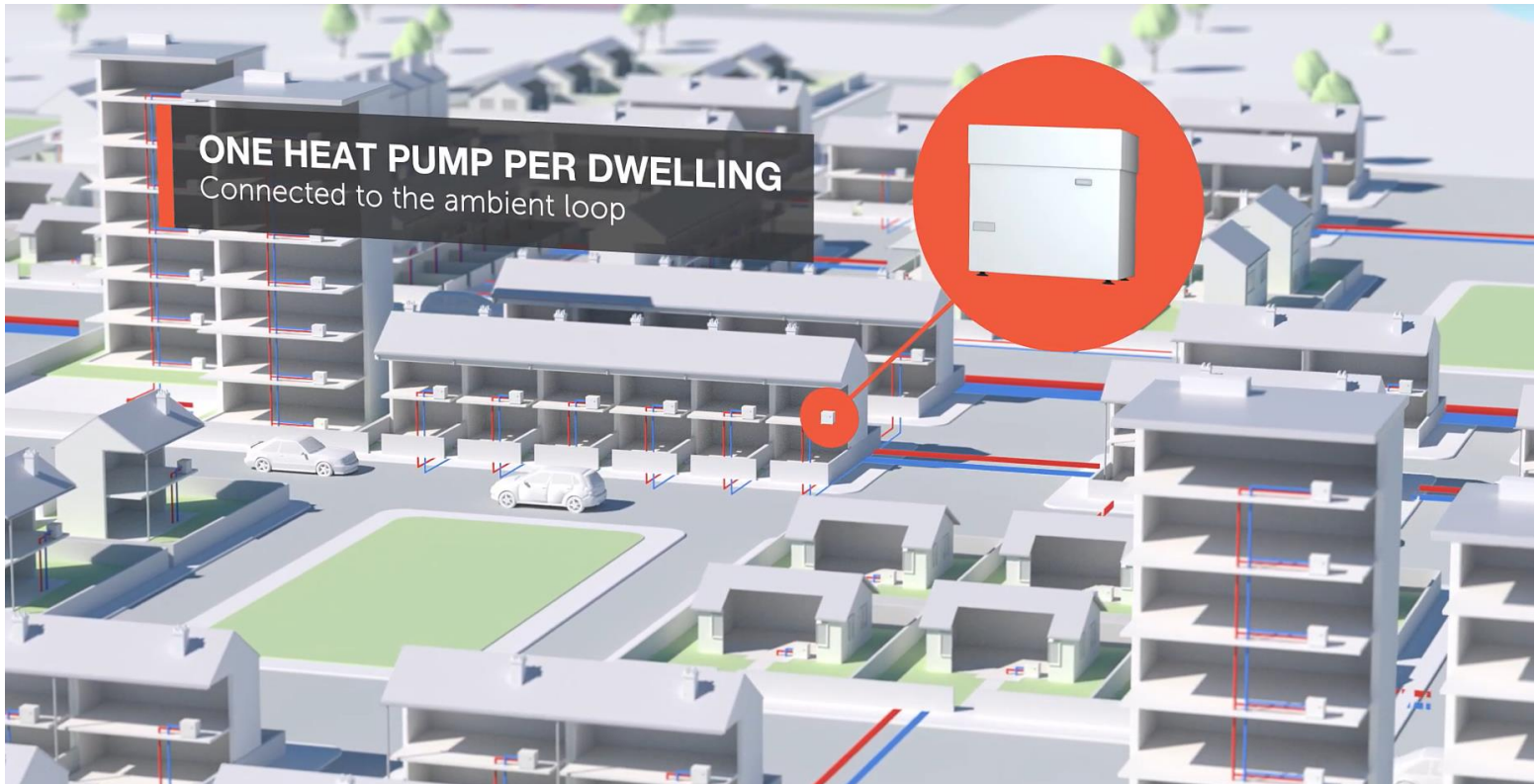
- Delivery of larger scale GSHP projects
- Turnkey project management solution
- Full or shared project management options
- Equipment supplied by Kensa Heat Pumps





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## KENSA CONTRACTING

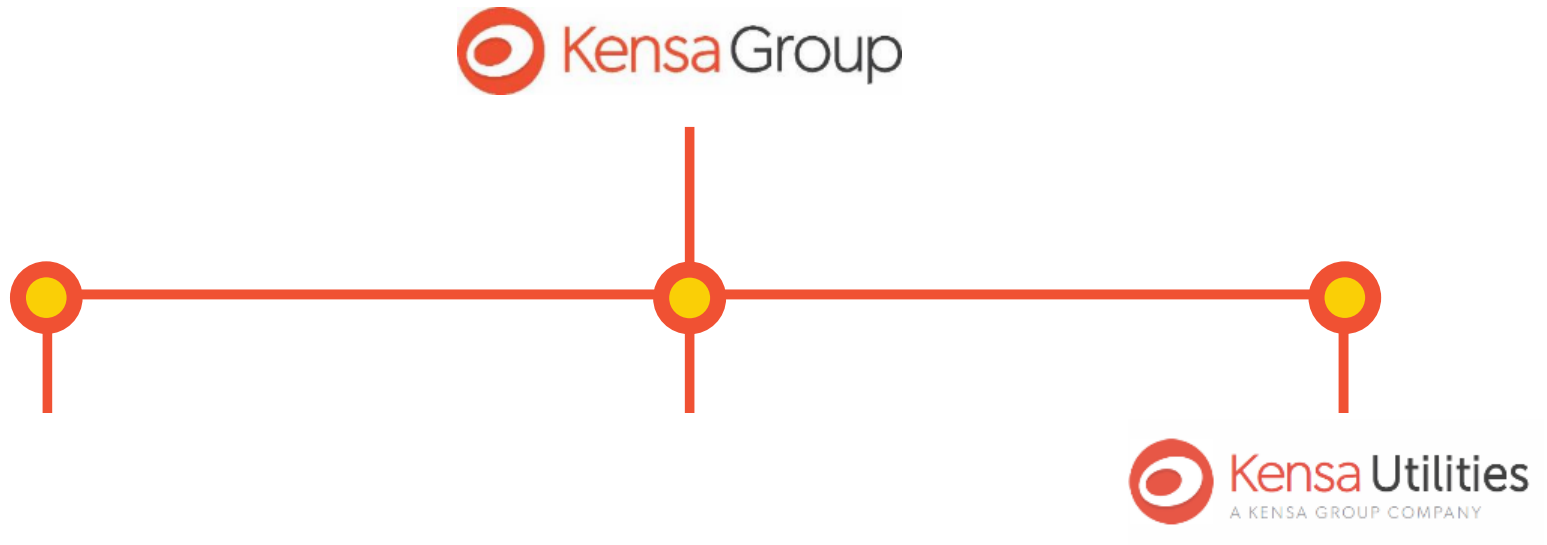




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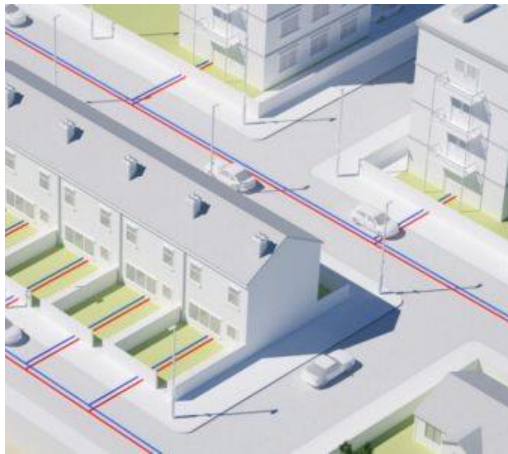
GROUP STRUCTURE

INTRODUCING KENSA

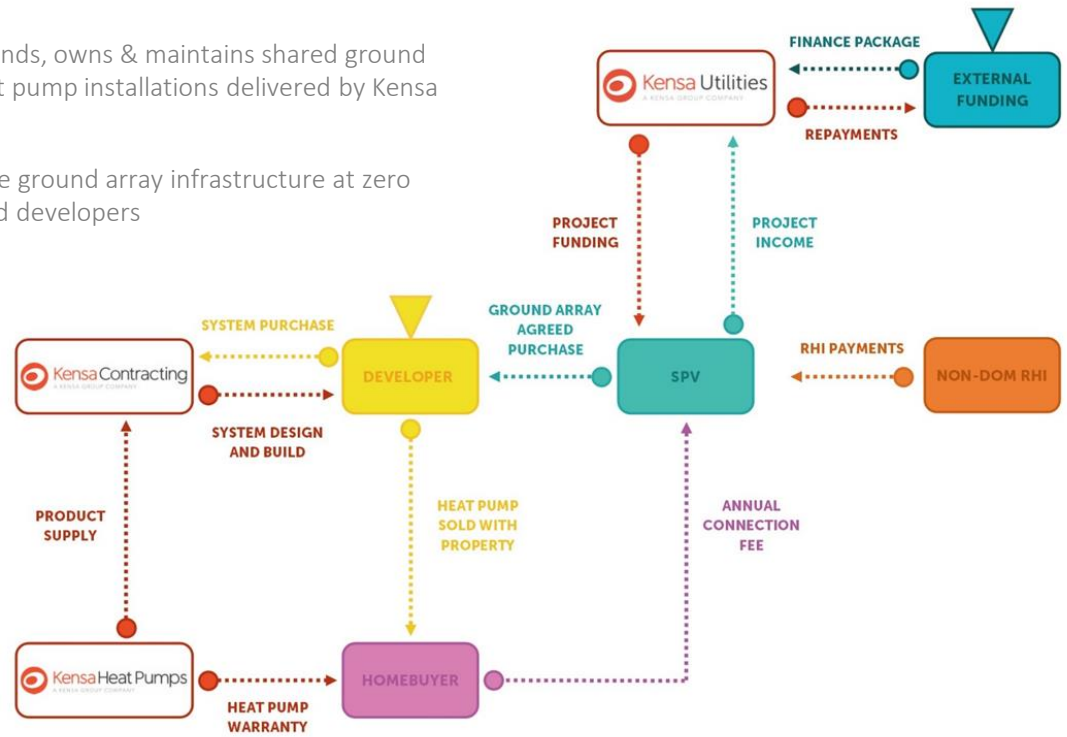


## KENSA UTILITIES

- A unique infrastructure asset company which funds, owns & maintains shared ground loop arrays that serve Kensa ground source heat pump installations delivered by Kensa Contracting.
- Kensa Utilities utilises subsidy support to provide ground array infrastructure at zero cost to house builders, housing associations, and developers



## INTRODUCING KENSA



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# GROUND SOURCE HEAT PUMP TECHNOLOGY



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

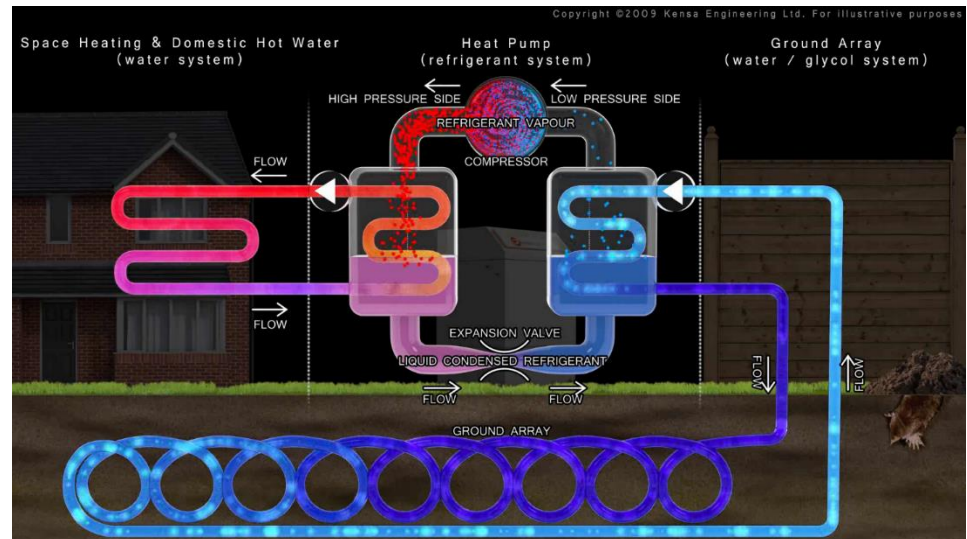
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## HOW A GSHP WORKS

## GSHP TECHNOLOGY

### 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

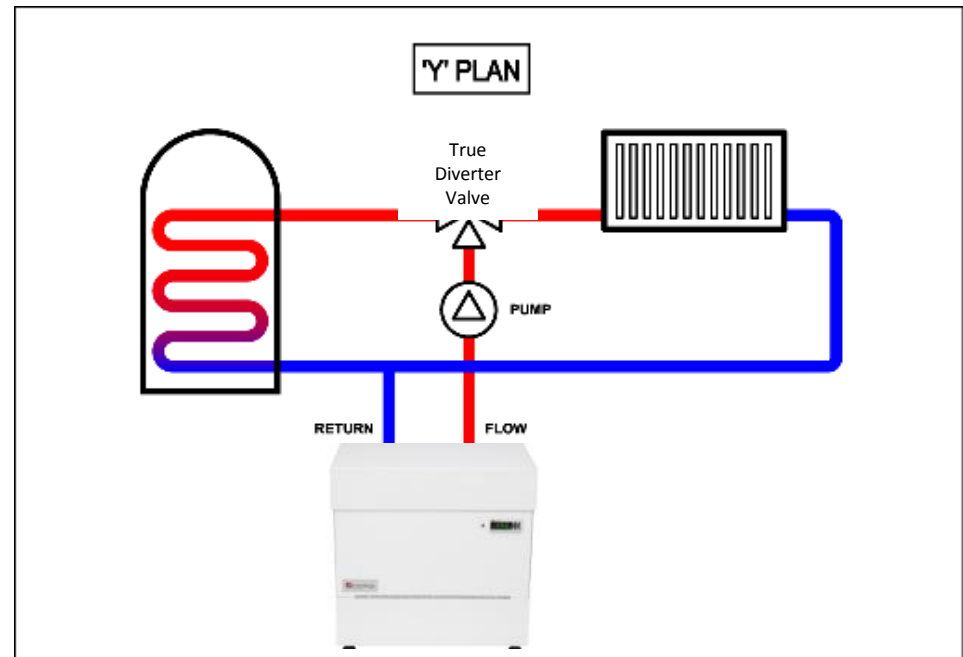


<https://www.kensaheatpumps.com/how-a-ground-source-heat-pump-works/>

## HOW A GSHP HEATING SYSTEM WORKS

## GSHP TECHNOLOGY

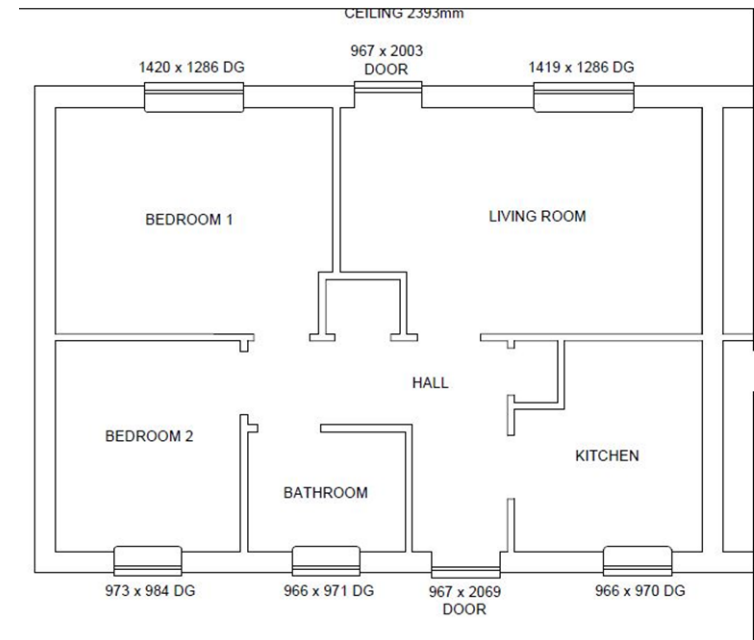
- The same way that a conventional boiler does
- Someone sizes the boiler (Heat Pump)
- Someone sizes the Radiators to work with the boiler
- Someone sizes the cylinder to work with the boiler
- The controls are the same heating controls
- With the ability to make them simple or complex
- Nobody worries about it not working when its cold
  
- THE ONLY DIFFERENCES ARE
  - Heat Pump (not boiler)
  - True Diverter valve (not mid position valve)
  - Brine supply loop (not gas supply)



## SYSTEM SIZING

- Elemental heat loss calculation to BS EN 12831
- Heat loss carried out room-by-room
- Peak heat load sized to 99.6% external air temperature
- Size to 100% of peak load
- No backup required
- Size hot water cylinder depending on need
- Choose heat pump depending on high output or high temperature
- Borehole sizing based on peak load and annual load

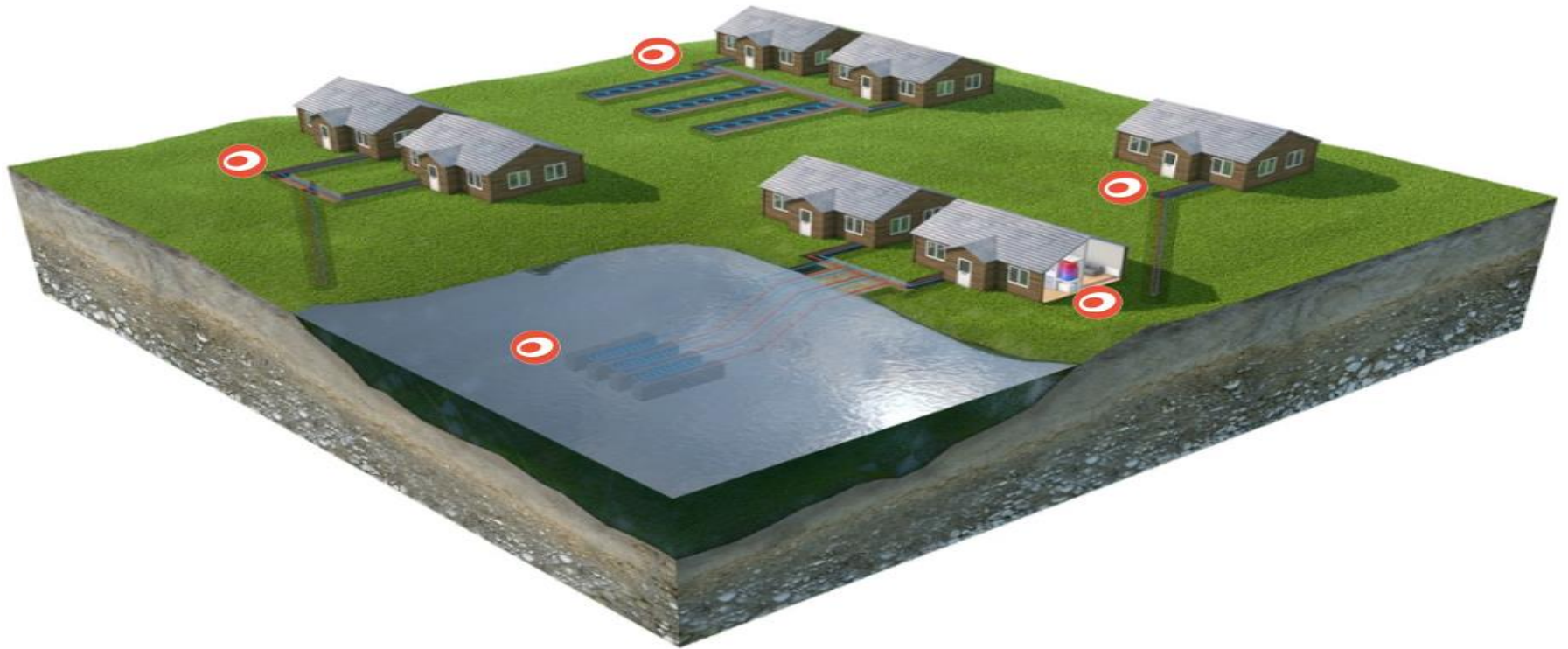
## GSHP TECHNOLOGY



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## METHODS OF HEAT EXTRACTION

## GSHP TECHNOLOGY



loop

<https://www.kensaheatpumps.com/the-technology/heat-sources-collectors/>



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## GSHP BENEFITS

### In brief:

- Extremely low CO<sub>2</sub> emissions enabling easy carbon and building regulations compliance
- No point of use NO<sub>x</sub> or SO<sub>x</sub> 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

## GSHP TECHNOLOGY



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# GSHPS & GOVERNMENT



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

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## ENVIRONMENTAL POLITICS

## GSHP's & GOVERNMENT

### Green politics / UK to put climate crisis and environment at the heart of overseas aid

Government will spend £193m on directly tackling climate-related issues in first initiative

Tory MPs set out manifesto urging more eco-friendly policies



INDEPENDENT

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## Theresa May will legally commit to ending Britain's global warming contribution by 2050 – without caveats

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### UK Parliament declares climate change emergency

1 May 2019

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## ENVIRONMENTAL POLITICS

## GSHP's & GOVERNMENT

1972

United Nations Conference on the Human Environment takes place

1979

World Climate Conference takes place in Geneva

1988

[Read more](#)



The Intergovernmental Panel on Climate Change is set up

May 1992

Convention on Climate Change is adopted

The text of the United Nations Framework Convention on Climate Change is adopted at the United Nations Headquarters in New York. This is the key international treaty to reduce global warming and help cope with the consequences of climate change. For the first time binding gas emissions reduction targets are set for industrialised countries.

1997



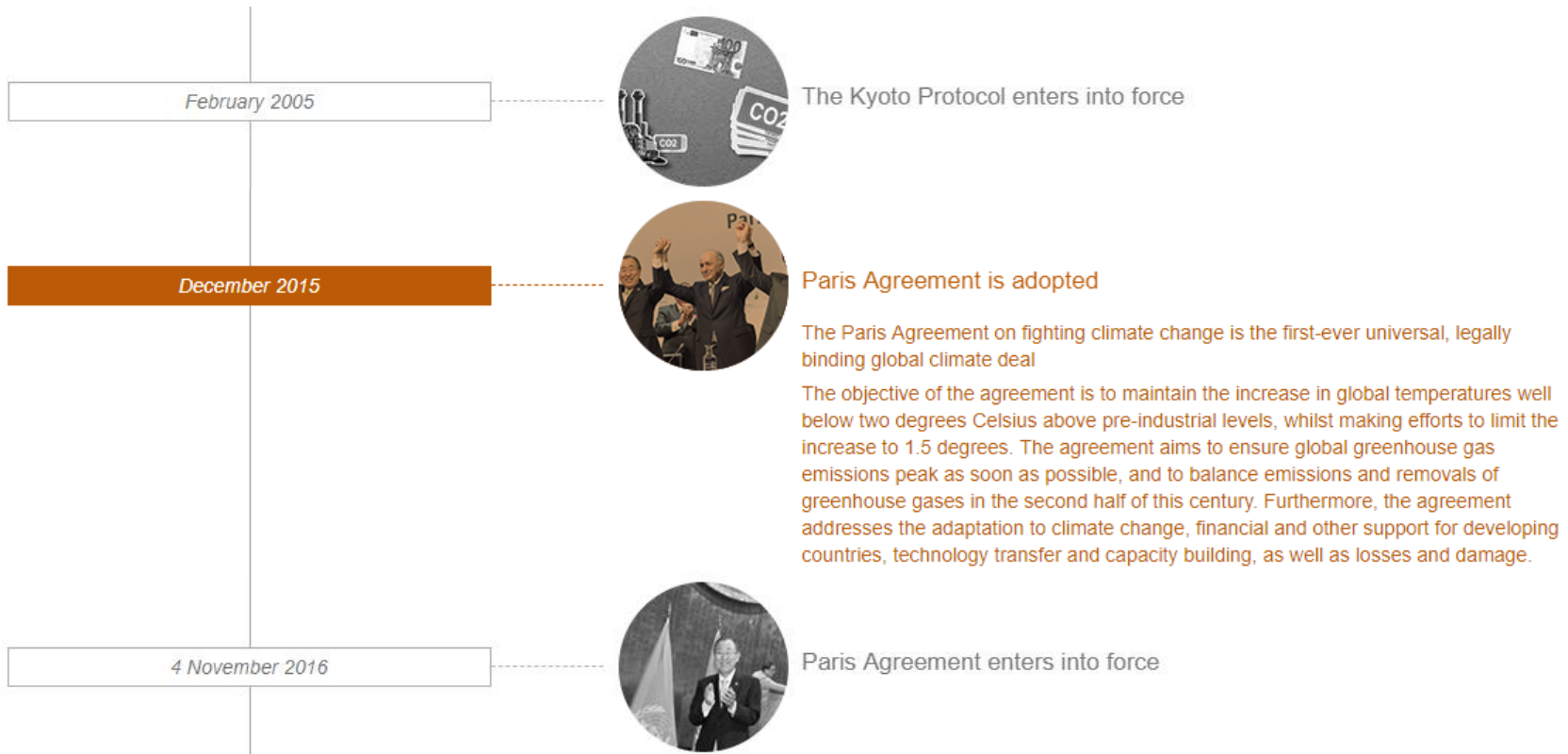
The Kyoto Protocol is adopted

The Kyoto Protocol is the world's first greenhouse gas emissions reduction treaty. The Protocol legally binds developed countries to emission reduction targets - an average of 5% by the period 2008-2012 with wide variations on targets for individual countries.

[http://www.europarl.europa.eu/infographic/climate-negotiations-timeline/index\\_en.html#event-1992-05](http://www.europarl.europa.eu/infographic/climate-negotiations-timeline/index_en.html#event-1992-05)

## ENVIRONMENTAL POLITICS

## GSHP's & GOVERNMENT

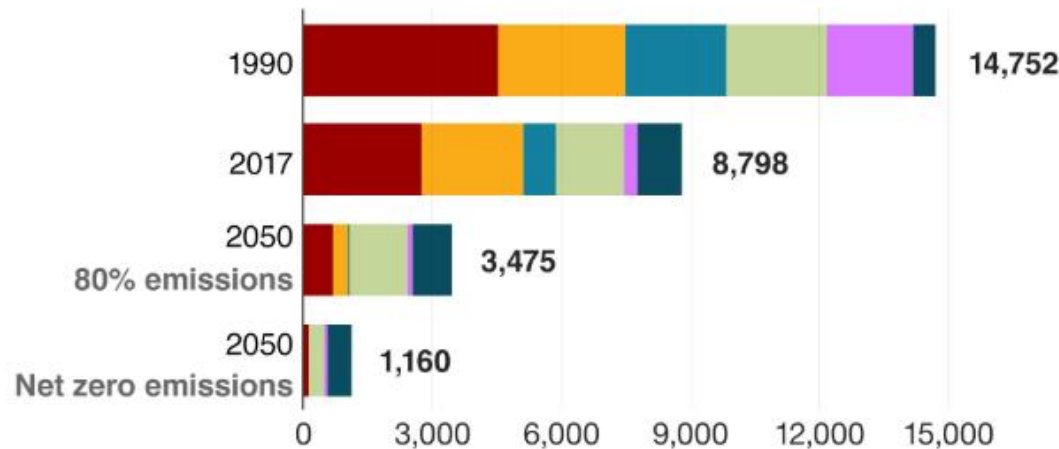


[http://www.europarl.europa.eu/infographic/climate-negotiations-timeline/index\\_en.html#event-1992-05](http://www.europarl.europa.eu/infographic/climate-negotiations-timeline/index_en.html#event-1992-05)

## Household emissions in 1990, 2017 and 2050

Annual emissions, kilogrammes of CO2

- Heating
- Transport
- Electricity
- Aviation
- Waste
- Diet / Agriculture



Source: Climate Change Committee/BEIS (2019)



Climate Change Act 2008

2008 CHAPTER 27

## LOW CARBON EMISSIONS

The carbon intensity of electricity generation has fallen significantly with further major reductions forecast for the next few decades.

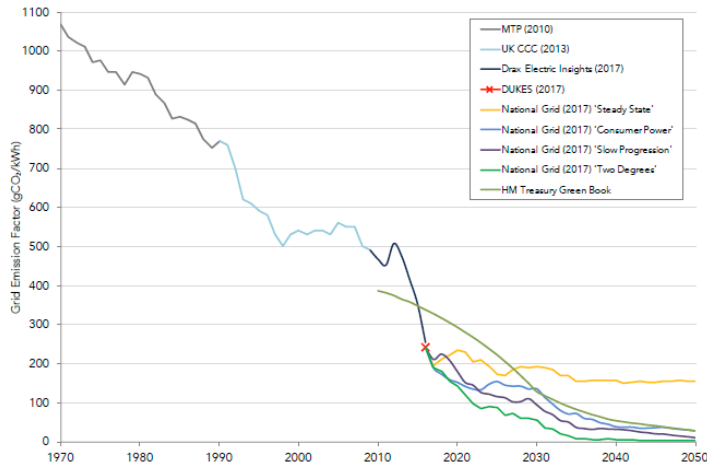


Figure 3.01 – Historic and projected carbon content of electricity

Source: Etude, *Low Carbon Heat: Heat Pumps In London* (September 2018)

## GSHP's & GOVERNMENT

The much-reduced carbon intensity of electricity generation will be reflected in the next edition of SAP.

Heat Source	Efficiency of Heat Source	Current SAP		Next Generation SAP (SAP 10)		Projected 2030	
		Carbon Intensity (kg CO <sub>2</sub> per kWh)	Carbon Emissions (kg CO <sub>2</sub> per kWh)	Carbon Intensity (kg CO <sub>2</sub> per kWh)	Carbon Emissions (kg CO <sub>2</sub> per kWh)	Carbon Intensity (kg CO <sub>2</sub> per kWh)	Carbon Emissions (kg CO <sub>2</sub> per kWh)
Gas Boiler	85%	0.216	0.227	0.208	0.219	0.208	0.219
GSHP	300%	0.519	0.173	0.233	0.078	0.15	0.050
Direct Electric	100%	0.519	0.519	0.233	0.233	0.15	0.150
GSHP Carbon Savings against Gas Combi Boiler			24%		65%		77%





*“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

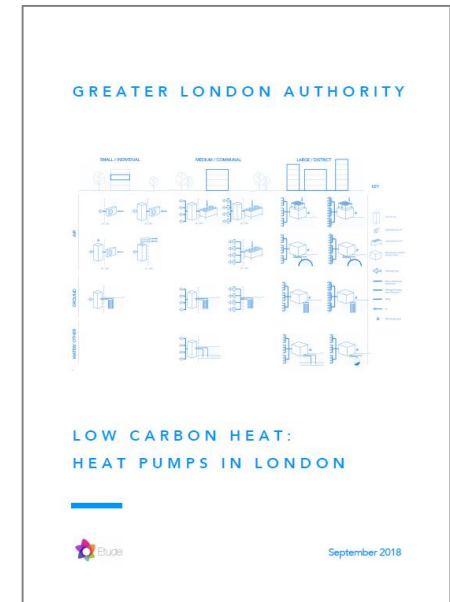
## GREATER LONDON AUTHORITY

- 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.

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## GSHP's & GOVERNMENT



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# GSHPs & HOUSEHOLDERS



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

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## DISTRIBUTION SYSTEM & CONTROLS

- Distribution system sized to 45°C flow temperature
- Radiators oversized
- Timeclock
- Central thermostat
- TRV on radiators
- Hot water priority
- 60°C stored hot water
- Local hot water cylinder



## DISTRICT HEATING vs SGLAs



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## TENANT TESTIMONIALS



*"We were spending £70 per week before on electric, we have now knocked that down by just over half, so it's a big difference and the house is really warm now.*

*"The system is very easy to use, simple, it's not hard at all, anyone could do it."*



*"Night storage heating was extremely dear, especially given that you didn't get any heat after tea time.*

*"I've been writing down how much money I've been putting in since the heat pump installation, I reckon I'm saving between 35-40% to what I was putting in before."*

## GSHPs & HOUSEHOLDERS



*"I've lived with many heating systems, coal, oil, gas, storage heaters, but ground source has to be my favourite, it provides a nice, gentle, constant heat that keep my home really comfortable."*

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## OTHER BENEFITS

- Low on-going maintenance and no need for annual servicing
- Reliable, supported by five year warranty and durable, long lifetime
- No impact on visual appeal of property
- No noise issues
- Ability to link to thermal storage
- Easy to use and simple controls
- Can adapt to smart control technology
- Small and compact – fits inside an airing cupboard

## GSHPs & HOUSEHOLDERS





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# DISTRICT HEATING VS SHARED GROUND LOOP ARRAYS

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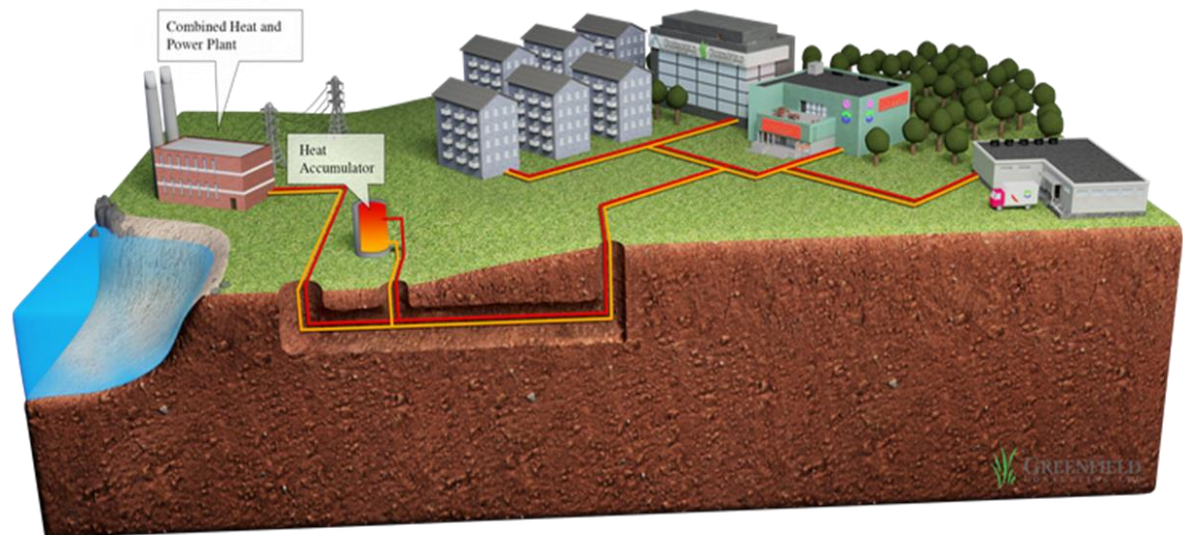
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## TRADITIONAL DISTRICT HEATING

## DISTRICT HEATING vs SGLAs

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



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# SGLA PROJECT OVERVIEW

ENGIE & Enfield Council



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

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## ENFIELD PROJECT – STEP BY STEP

## PROJECT OVERVIEW

### In brief:

- Client: Enfield Council
- Principal Contractor: ENGIE
- Specialist subcontractor: Kensa
- England's largest shared loop district GHSP system
- Eight tower blocks – up to 402 individual flats
- Expected 30-50% savings on residents' heating bills
- Significant CO<sub>2</sub> emissions reductions
- Generates 20 year RHI income for Enfield
- Enfield Council benefits from ECO funding
- Commenced: November 2017
- Completed: October 2018
- Total contract value: £7.3m



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## ENFIELD PROJECT – STEP BY STEP

## PROJECT OVERVIEW

### 1. Tenant liaison

- Resident remained in occupation throughout the works
- Resident Liaison Officers consulted each family before, during and after works
- Communal meetings held for each block prior to works
- Individual plans agreed to ensure safe delivery of works
- Access to respite area for residents
- Ability to view mock-up for typical flat installation
- Opportunity to ask technical/general questions

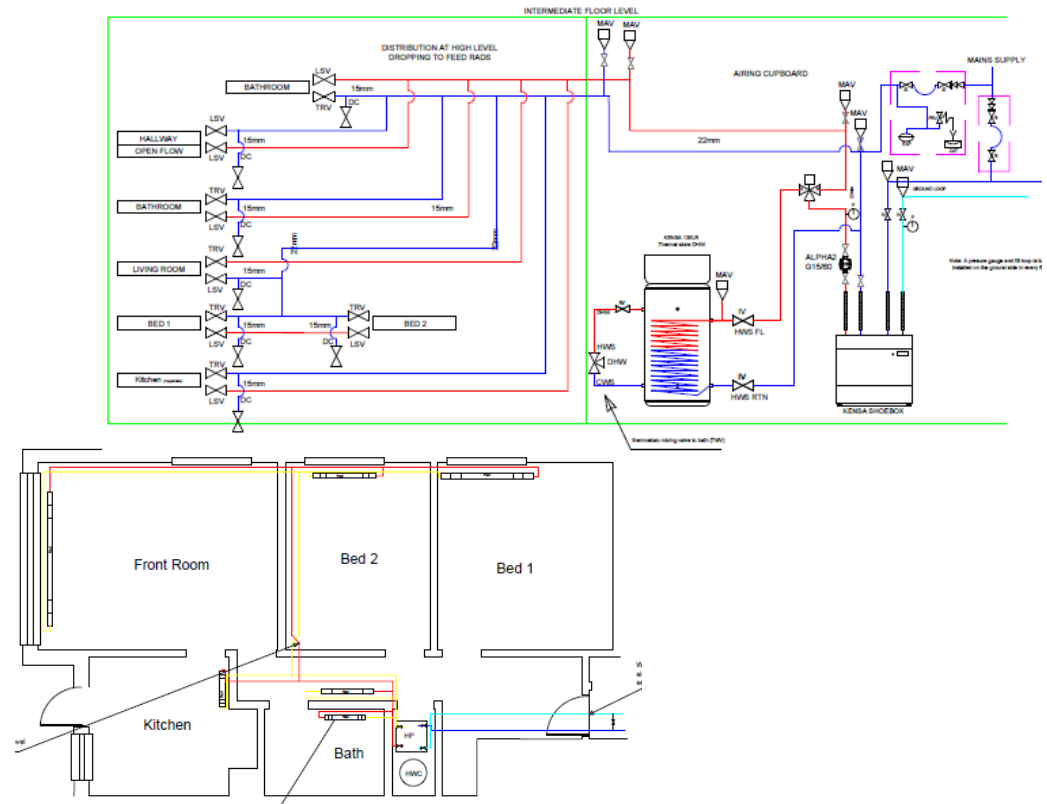


# ENFIELD PROJECT – STEP BY STEP

# PROJECT OVERVIEW

## 2. Survey and Design

- Detailed property surveys to establish heat loads for accurate heat pump sizing and radiator sizing
- Borehole design was a combination of desktop analysis and on-site Thermal Response Test
- Risers designed to ensure no requirement for central circulation pumps
- Surveys carried out to locate all buried services – both externally and internally



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## ENFIELD PROJECT – STEP BY STEP

## PROJECT OVERVIEW

### 3. Borehole drilling

- Specialist pre-drilling at each borehole location to rule out presence of UXO
- Channel Islands: 52 boreholes, 10,700 metres, 16 arrays
- Each array serves half a tower block – 6 or 7 floors and 24-27 flats
- Channel Islands drilling completed in four months
- Kettering Road: 48 boreholes, 10,000 metres, 16 arrays
- Kettering Road drilling will complete next week







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## ENFIELD PROJECT – STEP BY STEP

## PROJECT OVERVIEW

### 4. Trenching and headering

- Trenches are dug from each borehole
- Pipework (HDPE) is installed at the bottom of the trench connecting the boreholes to the manifolds
- Manifolds group the boreholes together into two arrays
- Two pairs of pipes run from manifolds into the basement of each tower block
- All ground reinstated at the end to match what was there previously



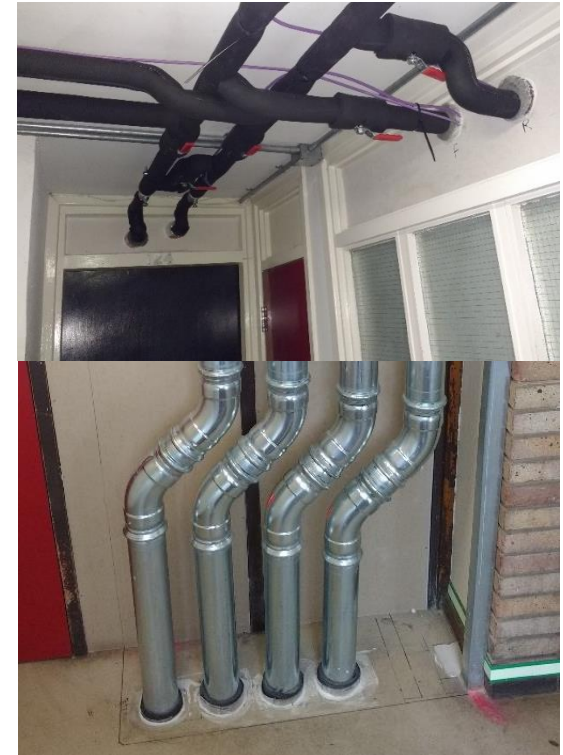
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## ENFIELD PROJECT – STEP BY STEP

## PROJECT OVERVIEW

### 5. Riser installation

- Risers installed in stairwells from basement to top floor
- Core drilling on each floor
- Four pipes from basement to 6th floor
- Two pipes from 7th to 13th floor
- Branches taken off at each floor to serve the four flats
- Pipework insulated to prevent condensation
- Will all be boxed in once completed
- All work approved by Enfield Council's fire safety team



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## ENFIELD PROJECT – STEP BY STEP

## PROJECT OVERVIEW

### 6. Flat installation

- Existing hot water cylinder and storage heaters removed (where fitted)
- New radiators and distribution pipework installed
- Heat pump installed in airing cupboard
- Shelf fitted and hot water tank installed above heat pump
- New controls – dial thermostat and twin channel programmer
- Ground array flushed and filled with anti-freeze
- Heat pump system switched on
- Existing electric UFH system de-commissioned
- Making good and pipework painted
- System handed over to resident





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## ENFIELD PROJECT – STEP BY STEP

## PROJECT OVERVIEW

### 7. Key outcomes

- £4.3 million RHI return
- ECO funding obtained for client
- 773 tCO<sub>2</sub> saving/yr
- Running costs for residents reduced from £900/yr to £350/yr
- Significant reduction in maintenance costs for Enfield Council



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## CONTACT DETAILS

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Tel. 01872 862140 | Mob. 07852 631 841

[www.kensacontracting.com](http://www.kensacontracting.com)

## Shoebox Ground Source Heat Pump

The Kensa **Shoebox Ground Source Heat Pump** Series features the quietest, smallest and most innovative ground source heat pump on the market.

Available in 3kW single compressor models and 6kW twin compressor models, the award-winning Kensa Shoebox Series is an efficient, practical and affordable heating solution engineered to provide both heating and hot water in new build and retrofit multi-dwellings and starter homes.

Explore example Shoebox **ground source heat pump costs** in our new Solution Centre.



[Community Heating - District Heating With Ground Source Heat Pumps](#)

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### Accreditations

