Ground Source Heating & Cooling

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Ground Source Heat Pump Association
Introduction & Agenda

• The Background
• Heat Pumps
• Ground Loops
• Geology & Permissions
• Buildings with Ground Source
• Ambient Temperature Networks
• Incentives, Commercial Returns & Carbon Reduction
• Environment Agency Regulation
• Questions
The Background....
Heat Pumps

• Move thermal energy from a source to a target
• Similar technology to the domestic refrigerator
• Predominately electrically driven
• Move more thermal energy than electrical energy consumed
Ground Loops

• Are heat exchangers, exchanging heat/coolth with the ground
• Come in a variety of geometries
• Address a substantial thermal mass for heat recovery
• Work via temperature difference
Closed Loop – Vertical

- Drilled to 150mm diameter
- 5m to 15m centres
- Contain U-tube probes of Polyethylene pipe
- Installed down to 250m below ground level
- Geology impacts performance, depth, meterage and layout
Closed Loop – Horizontal

• Trenches 1m to 2m deep
• Typically 1m wide
• Various geometries to suit space & application
• Harvest solar energy
• Different thermal energy storage & recovery to deep geology
Closed Loop – Surface Water

• Can be used in Sea, Lakes, Canals or Rivers
• Pipe coil or heat exchanger plate formats
• The main concern is where & how to anchor the loops or plates in moving water
• In still water it is relatively simple
Open Loop – Borehole

- Uses groundwater directly at around 11°C
- Most systems are non-consumptive (water returned to the aquifer) and so don’t impact on water resource
- Requires a different set of design skills to locate suitable aquifer and for borehole design
Open Loop – Surface Water

• Often known as Water Source Heat Pumps
• Use water directly from surface bodies like lakes, canals and rivers
• Filtration & maintenance are major considerations
Drilling & Geology

- Detailed understanding of the anticipated geological conditions is essential
- There is no statutory permission for closed loop except in coal mining areas
- The EA has published guidance which GSHPA has now adopted
- British Drilling Association Standards are well established
- GSHPA Standards are essential
- Geology can bite!
Environment Agency Regulation

- **EA not involved**
  - Too many and low or no impact

- **EA not involved**
  - Potential involvement with very large schemes

- **Regulation of larger schemes**
  - ‘Standard rules’ or ‘Bespoke’

- **Regulation of all schemes**
  - Abstraction and re-injection
  - Over 20m$^3$/day
In the Building – Domestic

• Can be deployed in new build or retrofitted
• Distribution system will need to be tailored to lower distribution temperatures
• Underfloor is ideal
• Hot water storage is generally required
In the Building – Commercial

• Again, retrofit or new build
• Can interface with all common distribution systems including,
  • 4 pipe fan coils
  • Underfloor
  • Chilled beams
  • Radiators
  • VRF/VRV
• Exceptional cooling performance
• Controls are key!
District Options

- Heat pumps lend themselves to district and micro district architecture
- Maximise heat recovery
- Leverage diversity
- Low temperature district options are efficient and offer low installation costs
District Networks as we know them...

- Central plant
- Insulated pipes
- Heat interface units
- Billing and metering
- Limited low grade heat recovery options
- Unfamiliar to UK consumers and businesses
The Ambient Alternative...

- Removes the insulated pipe
- Move the heat production equipment to properties
- No insulated pipe
- Independent billing
- Standing charge rather than meters
- No central run costs
- I own my own “boiler”
Inter-seasonal heat storage and recovery...

• Buffer
• Energy storage
The network grows....

- Future proofing
- Long term vision & planning
- Infrastructure scale asset
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- Other heat recovery options
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In Summary...

Conventional Approach  The Ambient Network
The Renewable Heat Incentive

• Major government policy under BEIS
• Pays per unit of heat
• Domestic stream pays for 7 years and is deemed
• Non-domestic 20 years and is metered
• Underpinned by MCS at sub 45kW scale
• Further refinements under consideration
The Business Case

• Outgoings,
  • Installation Cost
  • Maintenance
  • Fuel (Electricity)

• Income,
  • RHI
  • Fuel Savings

• IRR between 8% & 25% with current RHI
Carbon Reduction

• GSHP Systems Deliver,
  • Reduced run costs
  • Carbon reduction
  • Reduction in gas consumption

• They are a key part of the UK energy future to Carbon Zero in 2050

• As grid carbon falls this only gets better!
About the GSHPA

• Over 120 members from a variety of sectors concerned and working within the Ground Source Energy Industry

• Has significant influence with government departments on policy development

• Works on the development and issue of technical standards

• Essential point of contact for those within the industry and those considering using the technology
Questions....

and thankyou for listening

www.gshp.org.uk

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