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Introduction

• Context
• Market Summary
• Policy
• Innovation
• Research and Development
Context – UK Primary Energy Consumption

1990
- Primary electricity: 8%
- Gas: 24%
- Oil: 36%
- Bioenergy & waste: 0%

2019
- Coal: 3%
- Bioenergy & waste: 10%
- Primary electricity: 12%
- Gas: 39%
- Oil: 36%

Context – UK Sector Energy Consumption

2018 Consumption by Sector

Transport

Domestic

Industry

Services

Natural gas

Petroleum

Electricity

Bio & waste

H...
Context – UK Electricity Generation

Electricity Generated by Fuel Type

Context – Heating Systems

<table>
<thead>
<tr>
<th>Fuel Type</th>
<th>Number of Households</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mains gas</td>
<td>22 million</td>
</tr>
<tr>
<td>Electricity</td>
<td>2.2 million</td>
</tr>
<tr>
<td>Heating oil</td>
<td>1.1 million</td>
</tr>
<tr>
<td>District heating</td>
<td>420 thousand</td>
</tr>
<tr>
<td>Solid fuel</td>
<td>200 thousand</td>
</tr>
<tr>
<td>LPG</td>
<td>193 thousand</td>
</tr>
<tr>
<td>Other</td>
<td>4 thousand</td>
</tr>
<tr>
<td><strong>Total Households</strong></td>
<td><strong>26.2 million</strong></td>
</tr>
</tbody>
</table>

~4 million GB homes are off the gas grid
~1.3 million GB homes use oil/LPG for heating

Typical house gas consumption
13,000 kWh/y

- SH
- DHW
- Cooking

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Market – Domestic Heat Pumps

- Domestic heat pump sales remained relatively constant despite the introduction of the Renewable Heat Incentive in 2014.
- Sales have begun to increase as new policy certainty emerges and consumer awareness increases.
- The majority of growth is in air-water monobloc units which offer lower upfront cost and lower barriers for installation.
- Approximately 300k heat pumps are installed in homes today.
- Gas boiler sales are ~1.6 million units per year.
Market – Non-domestic

Air - Air & VRF Systems 2019 (Capacity)

- 46% < 5 kW
- 43% 5.01-7.0 kW
- 11% > 7.01 kW

Many large systems not captured in market data

Air- Air & VRF Systems Annual Sales

- Single splits
- Multi splits
- VRF

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Policy - Strategy

• **Clean Growth Strategy 2017**
  – Plan to phase out fossil fuel heating in new build homes and all buildings off the gas grid in the 2020s.
  – Will need to make strategic decisions about the gas grid

• **Clean Growth: Transforming Heat 2018**
  – Identified key barriers and evidence gaps that need to be tackled in early 2020s

• **10 Point Plan and Energy White Paper 2020**
  – Ambition for 600,000 heat pumps per year by 2028

• **Heat and Buildings Strategy 2021 – Coming Soon**

Policy - Strategy

Government is committed to delivering 300,000 new homes each year from the mid-2020s. New homes have low heat demand and no expensive retrofit costs, so are well suited for heat pumps.

There are over 5m homes and businesses off the gas grid which use oil, LPG or resistive electric heating. UK Government has already announced plans to phase out high carbon fossil fuel heating in 1.3m buildings off the gas grid in the 2020s. For these buildings, heat pumps are typically the most cost effective low-carbon heating solution.

The optimal solution for the 24.5m homes and businesses on the gas grid is uncertain and may vary locally. Options include heat networks, efficient electric heating solutions, like heat pumps, or replacing gas with low-carbon alternatives: hydrogen or biogas.

10 Point Plan and Energy White Paper 2020 - Ambition for 600,000 heat pumps per year by 2028

Policy – Heating Systems

• **Renewable Heat Incentive (RHI)**
  – Introduced for non-domestic in 2011 and domestic 2014
  – The first “feed-in tariff” for renewable heat.
  – Receive a price/kwh of renewable heat produced and paid over the lifetime of the installation
  – For heat pumps, biomass boilers, solar thermal, biomethane/biogas, deep geothermal.
  – Due to close for new applicants in March 2022

• **Clean Heat Grant**
  – Proposed policy to provide upfront grants for clean heating including heat pumps. Details to be finalised.
  – Successor to the RHI
Policy – Building Decarbonisation

£bn’s public investment in building decarbonisation schemes

- Home Upgrade Grant – focusing on whole house retrofits of lower income households
- Social Housing Decarbonisation Fund – focussed on whole house retrofits of social housing
- Green Homes Grant Local Authority Delivery Scheme – upfront grants for home-owners, including delivery through local authorities
- Public Sector Decarbonisation Fund – focussed on tackling public buildings

Regulations to mandate minimum building standards

- Tighter building regulations will phase out fossil fuel heating from 2025
- Regulations to move buildings up energy bands (A-G) with minimum requirements for private landlords
- Proposed regulations to phase out fossil fuel heating in buildings off the gas grid in 2020s

Obligation on energy companies to improve energy efficiency of homes

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Innovation

**BEIS Energy Innovation Programme**  
(£505m 2015 – 2021)

~£90m for project on the built environment

- Electrification of Heat Demonstrator – installing 750 heat pumps in homes, monitoring their use and aiming to demonstrate cost reductions
- Challenge funds for low carbon heating – to support a variety of innovative projects

**BEIS Net Zero Innovation Portfolio**  
(£1bn 2021 – 2025)

10 Priority Areas

- future offshore wind
- nuclear advanced modular reactors
- energy storage and flexibility
- bioenergy
- hydrogen
- homes
- direct air capture and greenhouse gas removal (GGR)
- advanced carbon capture, usage and storage (CCUS)
- industrial fuel switching
- disruptive technologies

https://www.gov.uk/guidance/energy-innovation  
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Research

• Large thematic area of end-use energy demand
• Research tends to focus on heat pumps in systems rather than component level
• Specific expertise on gas sorption heat pumps, energy storage, whole energy system modelling, building simulation modelling

https://www.gov.uk/government/collections/heat-pump-research
Summary

• Heat pumps in the UK are currently a niche market in homes but widely used in commercial buildings.
• The market is growing steadily but new policy developments are expected to increase this in specific areas e.g. new build, off-grid buildings.
• Ambition for high levels of heat pump deployment with key decisions around the role for hydrogen in heating needed in the next decade.
• Significant barriers remain around suitability of the building stock, consumer awareness, gas/electricity price ratio and upfront cost of systems.