Equipping homes for a low-carbon future

New Homes

Matthew Bailey
BA (Hons) | MSc | Cenv | MEI
18th January 2018
Background to Hodkinson Consultancy

- A specialist energy & environmental consultancy for planning and development.

- Our aim is to provide innovative and cost-effective strategies that respond to increasing demands for quality and construction efficiency.

- Formed in 1999, now employee owned, we provide a range of specialist technical services from planning applications through to post-construction assessments.
Our Work
Our Services

Energy & Environmental Planning
- Acoustics & Environmental Noise
- BREEAM Communities
- Daylight Sunlight
- Energy Statements
- Environmental Impact Assessments (EIA)
- Health Impact Assessments
- Lighting Pollution
- Noise Reports
- Overheating Analysis
- Planning Policy Advice
- Planning Pre-Assessments
- Renewable Energy Feasibility Studies
- Specialist Environmental Reports
- Sustainability Statements
- Zero Carbon Homes

Energy & Environmental Design
- Acoustic Design
- Alternative Methods of Construction
- Building Acoustics
- District Heating Advice
- Facade Optimisation
- Home & Building User Guides
- Inclusive Access
- Indoor Air Quality
- Overheating Analysis
- Passivhaus
- Post Occupancy Evaluation
- Secured by Design
- Solar Design
- Sustainable Drainage
- Thermal Bridging
- Utilities
- Water Use

Assessment & Compliance
- Air Tightness Testing
- BREEAM
- BREEAM Domestic Refurbishment
- CDM Advisor
- CDM Principal Designer
- Code for Sustainable Homes
- Home Quality Mark
- Passivhaus
- SAP
- SBEM
- Sound Testing
Background - why homes?

> Climate Change Act (2008): Greenhouse Gas emissions to be 80% of pre-1990 level
> Residential Sector accounts for 23% of end user emissions
> Carbon Plan required Zero Carbon homes from 2016 to deliver this target
> Zero Carbon target delayed in 2015
Background - why new build?

> c.30 million total homes by 2050
> 250,000 new homes/yr required
> A further 8 million new homes yet to be built
Background – why heat?

Typical Regulated Energy Demands - 2-bed flat

- Space Heating: 35%
- Water Heating: 56%
- Pumps and fans: 7%
- Lighting: 2%
Success Criteria

How can we judge the success of energy strategies for new-build homes?

- Environmental performance
- Affordability
- Reliability
- Comfort
- Deliverability
Energy Efficiency Challenges

> There is significant scope to further reduce residential heating demand beyond current new-build standards
Energy Efficiency Challenges

- Significant challenges when reducing space heating demands:
  - Cold Bridging
  - Overheating
  - Ventilation and air quality
  - Daylighting
  - Quality of work

- Complex design decisions required at an early stage:
  - Orientation
  - Massing
  - Glazing proportions
  - Shading
Supply of heat

- Dwellings will always require a small amount of space heating and will maintain a significant domestic hot water load.
- Supply of this heat must be decarbonized by 2050.
- The solution is far from clear, so a risk-based approach is needed in new-build housing.
Supply of heat

- Electricity is decarbonising quickly, but supply and infrastructure challenges remain.
- Gas is not – there is no clear pathway to low carbon gas currently being implemented.

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2016</th>
<th>2019</th>
<th>2022</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas Carbon Factor</td>
<td>0.216</td>
<td>0.208</td>
<td>0.208</td>
<td>0.208</td>
<td>0.208</td>
</tr>
<tr>
<td>(kgCO₂/kWh)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electricity Carbon</td>
<td>0.519</td>
<td>0.398</td>
<td>0.302</td>
<td>0.229</td>
<td>0.183</td>
</tr>
<tr>
<td>Factor (kgCO₂/kWh)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Supply of heat

Passivhaus Fabric Standards

<table>
<thead>
<tr>
<th>Year</th>
<th>Baseline</th>
<th>35% Target</th>
<th>Communal Gas Boilers</th>
<th>Communal CHP</th>
<th>Individual Electricity</th>
<th>Communal Heat Pumps</th>
<th>Individual Heat Pumps</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2019</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2021</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2023</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2025</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Supply of heat

<table>
<thead>
<tr>
<th></th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultra energy efficient</td>
<td>• Key to meeting targets</td>
<td>• How is hot water addressed in high density dwellings? • Can lead to poor quality homes if bad design</td>
</tr>
<tr>
<td>dwellings</td>
<td>• Reduces fuel costs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Can provide high quality homes</td>
<td></td>
</tr>
<tr>
<td>Continued use of gas</td>
<td>• Cheap fuel source</td>
<td>• Gas decarbonisation far from guaranteed • Grid upgrades required • Security of supply</td>
</tr>
<tr>
<td>grid</td>
<td>• Extensive supply available</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Can meet peak heat demands</td>
<td></td>
</tr>
<tr>
<td>Electricity</td>
<td>• Flexible power source for heat pumps, resistance heating etc.</td>
<td>• Insufficient supply • High cost option • 50% generation increase required • 1000% increase in storage required</td>
</tr>
<tr>
<td></td>
<td>• Can lead to efficient heat delivery</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Rapidly decarbonising</td>
<td></td>
</tr>
<tr>
<td>Waste Heat</td>
<td>• Already sufficient to meet demand 2 times over</td>
<td>• How to get heat to customers? • Supply is not yet guaranteed • Requires significant infrastructure investment</td>
</tr>
<tr>
<td></td>
<td>• Increased thermal generation of electricity to meeting heat pump loads will increase waste heat</td>
<td></td>
</tr>
</tbody>
</table>
Supply of heat - challenges

- Building Regulations Part L needs to be updated to reflect lower carbon electricity
- Energy efficiency must improve through standards and build quality.
- Heat pumps will form part of the solution in low density areas.
  - Size must be reduced through demand reduction (energy efficiency, solar etc)
  - Incentives required to increase uptake
Supply of heat - challenges

- Heat networks are key, but face significant challenges:
  - Heat losses and network efficiency
Supply of heat - challenges

![Bar chart showing CO2 emissions and losses for different Communal CHP scenarios. The chart includes baseline and 35% target lines.](Image)
Supply of heat - challenges

- Heat networks are key, but face significant challenges:
  - Heat losses and network efficiency
  - Leadership on supply of low-carbon, waste heat
  - Clarity on role of gas Combined Heat and Power
  - Greater regulation and consumer protection
  - Improved skills
Contact us

Matthew Bailey
Director
BA (Hons) | MSc | Cenv | MEI
matthew@hodkinsonconsultancy.com

The Heights, 59-65 Lowlands Road, Harrow, Middlesex, HA1 3AW
Office: 020 3603 1600

Company Registration Number: 03823513/England