Overview and Scrutiny

Communal Heating Systems Review

Housing Select Committee

May 2015

Membership of the Housing Select Committee in 2014-15:

Councillor Carl Handley (Chair)

Councillor Peter Bernards (Vice-Chair)

Councillor Paul Bell

Councillor John Coughlin

Councillor Amanda De Ryk

Councillor Maja Hilton

Councillor Simon Hooks

Councillor Olurotimi Ogunbadewa

Councillor Jonathan Slater

Councillor Susan Wise

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Chair's Introduction

The GLA is responsible for the London Plan which addresses carbon reduction and sustainable energy. Where does Lewisham Council fit in and how can we make sustainable energy work?

The Housing Select Committee entered into this in-depth work for two main reasons:

The first being that Lewisham Council has committed to building a number of new homes over the next few years, working alongside our Registered Provider partners and private sector developers to maximise homes being built within the Lewisham Borough. It is likely that some of these new homes will contain communal heating systems.

The second reason being that a large rebuild of homes on an estate by a Registered Provider which included a new communal heating system, experienced numerous difficulties in getting it to work efficiently. This caused tenants to make representations to their local Councillors and Councillor Amanda De Ryk picked up the challenge.

This report isn't applying blame to any parties, we want to achieve effective communal heating systems that work and at the right price for everyone including the developers and especially the end user.

I would like to thank all the people that have taken the time to come along to give evidence and opinions to the committee, which has contributed to the final report. Also my thanks to my Councillor Colleagues who undertook site visits to various communal heating systems, and to all the committee members who were part of the scrutiny process to enhance the findings of this report.

Lastly a big thank you to the Scrutiny officers Tim, Roger and Charlotte for their involvement in the process and putting this report together with Councillor Amanda De Ryk.

Councillor Carl Handley
Chair of the Housing Select Committee

Select Committee Members 2014-15

Councillor Handley
(Chair)

Councillor De Ryk

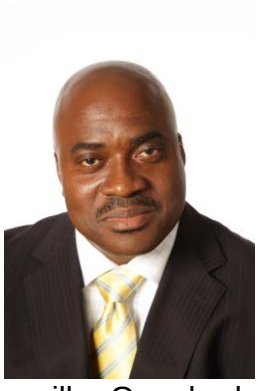
Councillor Bernards
(Vice Chair)

Councillor Bell

Councillor Coughlin

Councillor Hilton

Councillor Hooks



Councillor Ogunbadewa

Councillor Slater

Councillor Wise

1. Executive Summary

1.1 Decentralised energy features heavily in European, national and regional carbon reduction policy, with the proponents of such systems believing that, no matter what the scale of the system, or the fuel used, communal heating systems result in fewer carbon emissions than that which would result from traditional, non-communal heating systems. However, local experience of such heating systems suggests that their performance in practice does not always match up to their predicted performance, both in terms of efficiency and carbon reduction and in terms of costs to residents. This review therefore sought to examine how communal heating systems were being deployed in Lewisham with a view to ensuring the future effective deployment of communal heating systems in the borough, wherever their use was appropriate.

1.2 The review considered a wide range of evidence from those behind the policies that promote communal heating systems; the developers, housing bodies and engineers commissioning and installing the systems; the organisations running the systems; the officers responsible for authorising and checking the installations; the relevant industry body; and the consumers themselves. The review's key finding was that there was, as suspected, a sizeable 'performance gap' with many systems failing to meet expectations. The Committee therefore recommends that the focus of all parties should shift more towards actual performance and away from mere compliance with regulations, and that a thorough evaluation of existing systems should take place.

1.3 The review also found that scale and balance is crucial. Larger scale installations bring economies of scale and a mix of residential and commercial properties result in balanced heat and power requirements which mean that less surplus heat is created. This saves carbon and avoids the overheating problems that have affected a number of developments. As well as creating an unpleasant environment for residents, high levels of heat loss and overheating also increase costs and these are often passed on to the consumer in the form of higher bills.

1.4 A number of witnesses giving evidence to the Committee mentioned that lack of expertise amongst staff at every level was an issue. This is concerning as, to be successful, communal heating systems need to be expertly planned, delivered, maintained and monitored.

1.5 The Committee has made a number of recommendations which it believes will help address the issues it has uncovered and it looks forward to receiving the Mayor's response. In the meantime it hopes that the Council will 'slow down' the pace at which communal heating systems are being installed across the borough and make sure that other options for delivering carbon savings are explored.

2. Key Findings

2.1 Having considered the evidence presented to it over the course of the review, it is the Committee's opinion that:

There is a gulf between how communal heating systems appear on paper and how they function in practice.

***A shortage of expertise*:** To be successful, communal heating systems need to be expertly planned, delivered, maintained and monitored. This requires those planning, installing, maintaining and monitoring such schemes to have specialised skills. The Committee believes that there is currently a skills shortage in many of these areas. Although a relatively new technology in this country, the policy push for installing communal heating systems has meant that the demand for such systems is very high – and the consequent demand for skilled workers at all stages of the process is outstripping supply. In particular, the Committee is concerned that, historically, many housing providers have not fully understood the systems they have installed in their developments or recognised the expertise that they require in order to maintain and monitor the systems.

A lack of evaluation: Whilst EU, national and regional policy is championing the installation of communal heating systems, relatively little evaluation has been carried out as to how these systems are working in practice, both in terms of carbon reduction and consumer satisfaction. The Committee believes that if extensive evaluation took place, some of the problems identified during the course of this review might be found to be widespread. Sector-wide acknowledgement of the problems that can occur would provide an impetus to improve practice, develop expertise and narrow the gap between how the systems work in theory and how they function in reality.

2.2 Other findings of the Committee are as follows:

1. The policy push towards communal heating systems gives the impression that they are the only way of achieving required carbon reduction targets in the housing sector, meaning that other avenues of reducing the carbon footprint of new housing developments such as building new properties to a higher standard (e.g. ultra low energy buildings which require no heating) are not being explored. This is particularly concerning given the gap between the performance of communal heating systems on paper and in practice: the carbon reduction targets associated with these systems are rarely achieved.

2. Scale and balance is crucial. District heating systems seem to work better than smaller communal heating systems which only cover a single residential development as they (a) are larger scale, so benefit from greater economies of scale; and (b) involve a mix of residential and commercial properties, so have balanced heat and power requirements

that are more evenly spread over 24 hours, meaning that less surplus heat is created.

3. Overheating appears to be a particular issue in many communal heating systems. Modern buildings are very air tight yet the planning requirements in relation to the ventilation, required to keep the buildings at an acceptable temperature, are sometimes ‘downgraded’ following ‘expert’ mitigation on the behalf of developers.

4. Communal heating systems can be expensive in practice and often require subsidies to keep them affordable for residents. Residents may be faced with higher bills than they would have received under a traditional, non-communal system once the subsidies are removed.

3. Recommendations

3.1 The Committee would like to make the following recommendations:

Recommendation 1:

The Council should explore the gap between the projected 'potential' performance of communal heating systems (manufacturer's estimations) and their 'as built' performance (actual performing rates). This could be done by engaging independent engineers, paid for by the developer, to assess the performance of the installed systems at a number of practical intervals as the scheme is built out. This would enable the Council to produce a revised assessment of schemes once built, which would also incorporate any changes made during the building process.

Evidence base: The Zero Carbon Hub's research into the performance gap (paragraphs 6.57 to 6.59 of the report); the evidence supplied by the Council's Head of Regulatory Services (paragraph 6.55); and the evidence supplied by L&Q (paragraph 6.28).

Recommendation 2:

(i) The 'as built' assessment figures (see recommendation 1) should be compared with the Standard Assessment Procedure (SAP) calculator figures to determine if schemes are performing as expected and delivering the carbon savings they are intended to deliver.
(ii) The Council should lobby other local authorities and housing associations to collect 'as built' performance data.
(iii) This data should be shared with the GLA and DECC to allow a thorough evaluation of installed communal heating schemes to take place in the hope that a thorough evidential foundation can be established for communal heating schemes.
(iv) The Council should put pressure on the GLA and DECC to undertake this evaluation and develop a systematic approach to reviewing successful and less successful communal heating schemes. This would enable, for example, the GLA to better understand the impact of their decentralised energy policies, to verify their carbon saving calculations and help establish an evidence base which might encourage better practice across the industry.

Evidence base: Max Fordham LLP has reported that, in their experience, the energy loss from communal heating systems is significantly higher than is suggested by the SAP calculator (paragraph 6.37 and Appendix B which presents their analysis of typical heat losses). The GLA has acknowledged that there has not been detailed and extensive evaluation of installed communal heating systems (paragraphs 6.23 to 6.24).

Recommendation 3:

The Council should consider setting minimum design efficiency/loss requirements at the planning stage for communal heating schemes.

Evidence base: The ADE suggested that this could be one way of ensuring only high quality systems were installed (paragraph 6.11).

Recommendation 4:

The Council should consider undertaking a piece of work to compare costs, heat loss, carbon savings etc. for residents in new builds with communal heating systems and those with individual boilers, and then project these forward to assess if the benefits/losses even out in the future. In this way the Council can create a realistic heat comparator for residents.

Evidence base: Max Fordham LLP presented evidence to the GLA in 2012 which suggested that district heating systems could cost around twice as much to operate than gas combi boilers (paragraph 6.38 and Appendix B). The Which? Report suggests that many communal heating customers feel the costs they incur are unfair (paragraph 6.86 to 6.88).

Recommendation 5:

The Council should look very critically at attempts to down-grade or mitigate planning conditions that are made after planning permission has been granted.

Evidence base: The experience of residents at Parkside, as reported by James Gallagher and others (paragraph 4.2).

Recommendation 6:

As a local authority, Lewisham should 'slow down' the pace of adopting communal heating systems and make sure that we critically engage with other options available to deliver carbon savings, moving our emphasis from simple compliance to actual performance.

Evidence base: The Zero Carbon Hub's research into the performance gap (paragraphs 6.57 to 6.59 of the report) and the evidence supplied by the Council's Head of Regulatory Services (paragraph 6.55).

Recommendation 7:

The Council should insist on the installation of ultra-low NOx boilers in medium and poor air quality zones.

Evidence base: The evidence from Barratt's about the emission of NOx from communal heating systems (paragraph 6.72).

Recommendation 8:

Based on the evidence the Committee heard, the definition of what constitutes a major development (10 units+) falls below the threshold of a viable communal heating system. Planning decisions need to properly take into account the viability of such schemes, particularly given the air-tightness of new dwellings.

Evidence base: Visits to existing successful schemes which suggested that scale and balance are crucial to allow economies of scale and reduce the generation of surplus heat that can lead to overheating (paragraphs 6.77 to 6.85) and the evidence of E.ON and Barratt homes on viability (paragraph 6.61).

Recommendation 9:

The Council should consider insisting that all developers using district heating sign up to and comply with the Heat Network Code of Practice, prioritise cases of overheating and follow good practice established elsewhere. This should include existing social housing developments where communal heating systems have been installed and where poor performance has been reported.

Evidence Base: The ADE suggested that this could be one way of improving consumer confidence in communal heating systems and strengthening the quality of installed systems (Appendix D).

Recommendation 10:

The Council's Head of Law should be asked to comment on the equalities and other legal implications of communal heating schemes, in particular that high charges mean that some of the borough's poorest residents are paying to deliver wider carbon savings; and that, where there is no opportunity to opt out of the communal system residents are, in effect, being denied a choice of heating and hot water supplier.

Evidence Base: The experience of residents at Parkside, as reported by James Gallagher (paragraph 6.48); information received on the Landlord and Tenant Act 1985 (paragraphs 6.75 and 6.76).

Recommendation 11:

South East London Combined Heat and Power (SELCHP) is a good example of a large scale, viable district heating scheme. The Council should work hard to bring forward proposals to connect Lewisham housing estates to the network.

Evidence Base: The visit to SELCHP (paragraphs 6.83 to 6.85).

4. Purpose and Structure of the Review

4.1 At its meeting on 22 July 2014, the Committee decided to carry out a review into communal heating systems.

4.2 A key driver behind the Committee's decision to carry out the review was the reported experience of residents at the Parkside Housing Estate. The newly regenerated estate had had, in accordance with Greater London Authority (GLA) guidance, a communal heating system installed. However, residents were of the opinion that this had been poorly delivered as there were a number of ongoing problems including:

- **Overheating** - the mechanical ventilation system initially planned for installation had been replaced by a more passive ventilation system that pushed heat around individual flats but not effectively enough to remove all of the excess heat. In order to keep rooms at temperatures within the Chartered Institution of Building Services Engineers (CIBSE) standards[1], automatic opening vents had been installed on all doors and windows in communal areas and residents had also been told to keep the windows in their flats open in the warmer months. This was not felt to be an acceptable solution, in terms of noise (given the proximity to a major road), safety (especially for ground floor flats) and pollution (due to the poor air quality locally).
- **Cost** – there had been a number of issues with the billing system for the supply of heat, hot water and electricity, resulting in large bills being sent out sporadically rather than regular billing. In addition, many residents were concerned at the level at which the standing charge was set; and also the amount they were being charged for their individual use (calculated via heat interface units) which was higher than the indicative costings initially provided.

4.3 The Committee therefore wanted to understand why and how such communal heating systems were being deployed in Lewisham with a view to ensuring that such systems were effective; and planned, maintained, monitored and, if necessary, rectified in a timely and successful manner.

Timetable

4.4 At its meeting on 1 October 2014, the Committee considered a scoping report for the review and agreed terms of reference. It was decided that the review would explore the following themes and seek answers to the following questions:

[1] For further information see: http://www.arca53.dsl.pipex.com/index_files/thermco2.htm

Overarching Review Question

- How can the Council help to ensure the effective deployment of communal heating systems in the borough, where appropriate?

4.5 In order to answer this question, it was agreed that the Committee would need to establish the following:

- An understanding of the issues influencing the development and deployment of heating systems in Lewisham
- Evidence of the benefits and drawbacks of existing communal heating systems in the borough
- The factors influencing the effective design and operation of heating systems.

4.6 This would involve focussing on the following key areas:

- Design (including predicted costs and energy consumption contrasted with actual costs and energy consumption from case studies)
- Implementation (including problems with construction)
- Monitoring and operation (including running costs)
- Lessons that can be learnt for future developments.

Witnesses

4.7 Evidence sessions were held on: 11 November, 2014, 17 December 2014 and 28 January 2015. The witnesses who gave evidence to the Committee were:

Jonathan Graham, Policy Manager, Association for Decentralised Energy (formerly the Combined Heat and Power Association)

The Association for Decentralised Energy is an industry membership body, which brings together parties interested in combined heat and power, district heating and cooling technologies and demand side energy services. It believes that combined heat and power at all scales and with all fuels has the ability to reduce users' bills and carbon emissions compared to the separate generation of heat and power.

Peter North, Senior Manager, Programme Delivery - Sustainable Energy, Greater London Assembly (GLA)

The GLA is responsible for the London Plan. The London Plan requires all proposals for major developments to include detailed energy assessments as part of their submission for planning permission to demonstrate how they intend to meet the London Plan target for carbon dioxide emissions, including evaluating combined cooling, heat, and power and combined heat and power systems.

Robin Feeley, Director, L&Q Energy, London & Quadrant (L&Q)

L&Q has 2500 homes in Lewisham, including a new development at Loampit Vale with a communal heating system.

Bertie Dixon, Consultant, Max Fordham LLP

Max Fordham LLP is a consultancy specialising in engineering and construction, that has worked on a number of local authority housing developments, including projects in Lewisham such as Milton Court. They have installed and refurbished a variety of different heating systems over recent years.

James Gallagher, Chair of Parkside Residents' Association

The Parkside Residents' Association has a number of concerns about the communal heating system installed on the estate and complaints from estate residents helped trigger this review.

Brian Regan, Planning Policy Manager, LB Lewisham

The Council's Planning Policy in relation to communal heating systems is, in part, shaped by the London Plan. The London Plan states that "The Mayor will and boroughs should in their Development Plan Documents require all developments to demonstrate that their heating, cooling and power systems have been selected to minimise carbon dioxide emissions"[2]. Lewisham's policy is to ask for major planning schemes (with 10 units or above) to consider the installation of a communal heating system.

Vimal Bhana, Head of Energy, Barratt Homes

Barratt Homes has worked with E.ON to deliver a number of housing developments with communal heating systems.

Jeremy Bungey, Head of Community Energy, E.ON

E.ON currently operates 28 Communal Heating Systems in various types of housing developments and has worked closely with Barratt Homes over a number of years.

Visits

4.8 The Committee also went on the following visits:

- Bunhill Heat and Power – Monday 19 January 2015
- Pimlico District Heating Undertaking (PDHU) – 22 January 2015

[2] London Plan, Consolidated with Alterations since 2004, page 204

- South East London Combined Heat & Power (SELCHP) – 26 January 2015

4.9 The Committee agreed its final report and recommendations in May 2015.

Definitions

4.10 The following terms are used in this review:

Communal Heating System: A heating system which supplies heat to a number of dwellings from a common heat source. Communal heating systems range in complexity from simple systems which might heat a single block of apartments to larger scale systems which might heat many buildings, both domestic and commercial.

District Heating System: A large scale communal heating system which heats many buildings, typically a number of residential buildings and one or more commercial buildings (such as a swimming pool).

Combined Heat and Power System (CHP): A communal heating system which generates electricity (that can be sold to the national grid) as well as heating.

Combined Cooling, Heat and Power System (CCHP): A communal heating system which generates electricity as well as heating; and also provides cooling[3].

A note on the drivers behind communal heating systems

4.11 A number of benefits are claimed for communal heating systems. In theory, efficiencies (and therefore carbon saving) should be achieved through the economies of scale of heat production. The use of communal heating systems can also allow for the deployment of low carbon technologies that might not be feasible on a home by home basis, including geothermal heat; solar heat; sewage; and biomass. More information is provided in the policy section of this report. It is generally accepted that communal heating systems are able to achieve the highest levels of efficiency on sites with a constant, stable and large demand for heat (and power if the system is a CHP). Therefore they tend to work best if a significant number of buildings are connected, which produce a continuous requirement for heat (over 24 hours). Where there is not stable demand for heat, overheating can occur. To combat this, communal heating systems can include heat interface units in each property, which are designed to regulate and measure the flow of heat into and out of each home. However, these units cannot

[3] The term **trigeneration** refers to the use of a combined heat and power system alongside an absorption chiller to provide electricity, heat and cooling.

tackle every form of overheating (for example, heat escaping from pipe running beneath the floor of a property).

A note on the roles of planning and building control

4.12 The role of planning in relation to the development, installation and operation of communal heating systems is that decisions on planning applications should be based on policies in the development plan unless other material considerations outweigh these. National, regional and Lewisham Planning Policy all promote decentralised energy provision. The development plan for Lewisham comprises the London Plan 2011, The Core Strategy 2011; and other adopted Local plans.

4.13 For all major applications the Planning Service encourages pre-application discussions and the development of a Planning Performance Agreement (PPA). In developing the PPA, Planning Officers will wish to include discussions covering communal heating systems. Planning officers will ask that an energy strategy including CHP be provided. Energy Assessments are assessed against policies in the London Plan and the Core strategy. If the application is referable to the GLA then they will be consulted, otherwise specialist advice is provided by the Lewisham Sustainability Officer. Through the PPA process, officers will seek to ensure that detailed discussions have taken place before the submission of an application, so that the submitted documents reflect what has already been accepted in principle.

4.14 A communal heating system is usually installed at the time of the original construction. The developer/owner commissions an energy assessor to carry out the necessary procedures to ensure the building complies with the government's carbon emissions targets. This is done by reference to the Governments' Standard Assessment Procedure 2012. It is Building Control's job to ensure this procedure is correctly carried out and that all necessary documents and assessments are submitted. During construction, Building Control's role is to ensure that the system is installed to the plans submitted and that the necessary thermal insulation is in place. Enforcement action can be taken if necessary although this is rare. After the Building is 'signed-off' Building Control have no further involvement.

5. The Policy Context

5.1 Carbon reduction is a key element of the policy context for communal heating systems as proponents of such systems believe that, no matter what the scale of the system, or the fuel used, they result in fewer carbon emissions than that which would result from traditional, non-communal heating systems.

European Policy

5.2 The European Union's 'Europe 2020' strategy is a growth strategy which aims to create the conditions for a more competitive economy with higher employment and enables the EU to become a smart, sustainable and inclusive economy. The strategy includes five ambitious objectives - on employment, innovation, education, social inclusion and climate/energy - to be reached by 2020.

5.3 In relation to 'climate change and energy sustainability', a 20% energy efficiency target, by 2020, has been established. This involves:

- Reducing greenhouse gas emissions to 20% (or even 30%, if the conditions are right) lower than the levels in 1990
- Ensuring that 20% of energy used in the EU comes from renewable sources
- To increase energy efficiency by 20%.[4]

5.4 The 2012 Energy Efficiency Directive[5] establishes a set of binding measures to help the EU reach its 20% energy efficiency target by 2020. Under the Directive, all EU countries are required to use energy more efficiently at all stages of the energy chain from production to consumption. This includes in housing.

Central Government Policy

5.5 The 2008 Climate Change Act[6] has committed the UK to becoming a low carbon economy, with a target of reducing carbon dioxide emissions by at least 80% on 1990 levels by the year 2050. Initiatives to increase the efficiency of energy usage in housing are a central part of ensuring the UK is able to meet this target. Government guidance on improving energy efficiency in new build homes is set out in the Code for Sustainable Homes[7]. The Code defines standards of energy efficiency and sustainability for new homes and coordinates a system of assessment and certification.

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[4] See: http://ec.europa.eu/europe2020/europe-2020-in-a-nutshell/targets/index_en.htm
[5] See: http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1399375464230&uri=CELEX:32012L0027
[6] See: http://www.legislation.gov.uk/ukpga/2008/27/contents
[7] See: https://www.gov.uk/government/policies/improving-the-energy-efficiency-of-buildings-and-using-planning-to-protect-the-environment/supporting-pages/code-for-sustainable-homes#history

5.6 The Department of Energy and Climate Change (DECC) has published a number of policy documents on increasing the use of low-carbon technologies and has reported that, currently, communal heating systems account for only 2% of the UK's heat demand[8]. However, the Government's heat map for England[9], produced to assist local authorities in planning, shows that nearly 50% of heat demand in England is concentrated with enough density to make heat networks worth investigating.

5.7 DECC's publication 'The Future of Heating: Meeting the challenge'[10] outlines a number of actions that it thinks should be taken in relation to communal heating systems to help deliver more low carbon heating in the UK, including:

- Supporting local authorities in developing heat networks by establishing a Heat Networks Delivery Unit (HNDU) within the Department that will work closely with individual authorities' project teams in England and Wales.
- Exploring the scope for extra financial incentives for renewable heat networks within the Renewable Heat Incentive (RHI) in 2014 and also access to a number of streams of capital funding provided by government.
- Endorsing an industry-led consumer protection scheme for heat network users later this year, and encouraging the heat networks industry to work with consumer groups in developing this practice.

5.8 The UK Heat Network (Metering and Billing) Regulations 2014[11] implement the requirements in the 2012 Energy Efficiency Directive (EED) outlined in paragraph 5.3 with respect to the supply of distributed heat, cooling, hot water and cold water.

Regional Policy

5.9 The London Plan[12] is the main regional plan dealing with carbon reduction. The ambition for London is that it should reduce its carbon dioxide emissions by 60% on 1990 levels by 2025. Through the London Plan, the Mayor expects all new developments to:

- Be lean: use less energy
- Be clean: supply energy efficiently
- Be green: use renewable energy

[8] See: https://www.gov.uk/government/policies/increasing-the-use-of-low-carbon-technologies/supporting-pages/heat-networks
[9] See: http://tools.decc.gov.uk/nationalheatmap/
[10] See: https://www.gov.uk/government/publications/the-future-of-heating-meeting-the-challenge
[11] See: http://www.legislation.gov.uk/uksi/2014/3120/pdfs/uksi_20143120_en.pdf
[12] See: http://london.gov.uk/thelondonplan/

5.10 Planning proposals for major developments are required to include detailed energy assessments as part of their submission for planning permission to demonstrate how they intend to meet the London Plan target for carbon dioxide emissions within the framework of this energy hierarchy. The Plan states that "The Mayor will, and boroughs should in their Development Plan Documents (DPDs), require all developments to demonstrate that their heating, cooling and power systems have been selected to minimise carbon dioxide emissions". The Plan also states that "developments should evaluate combined cooling, heat, and power (CCHP) and combined heat and power (CHP) systems and where a new CCHP/CHP system is installed as part of a new development, examine opportunities to extend the scheme beyond the site boundary to adjacent areas".

5.11 The Mayor of London expects all major developments to demonstrate that the proposed heating and cooling systems have been selected in accordance with the following order of preference:

- connection to existing Combined Cooling, Heat and Power (CCHP) or Combined Heat and Power (CHP) distribution networks
- site-wide CCHP/CHP powered by renewable energy
- gas-fired CCHP/CHP or hydrogen fuel cells, both accompanied by renewables
- communal heating and cooling fuelled by renewable sources of energy
- gas fired communal heating and cooling.

Council policy

5.12 Lewisham's Sustainable Communities Strategy sets out the ambition for Lewisham to be 'clean green and liveable'. The strategy highlights the importance of ensuring Lewisham's contribution to a sustainable future by tackling waste and making effective use of resources. Linked to this is the corporate priority "clean, green and liveable: improving environmental management, the cleanliness and care for roads and pavements and promoting a sustainable environment". The corporate priority "inspiring efficiency, effectiveness and equity**:** ensuring efficiency, effectiveness and equity in the delivery of excellent services to meet the needs of the community" is also applicable in relation to communal heating systems, as it seeks to ensure that all essential services are affordable for residents.

5.13 Lewisham's Carbon Reduction and Climate Change Strategy was published in 2008. In 2013 the Council set a new target of a 44% reduction in the borough's carbon emissions by 2020 from a 2005 baseline. Lewisham's Core Strategy, which directs the borough's planning framework and is required to align with the London Plan, includes the objective that "all new residential development (including mixed use) will be required to achieve a minimum of Level 4 standards

in the Code for Sustainable Homes from 1 April 2011 and Level 6 from 1 April 2016, or any future national equivalent".

6. The Evidence

Jonathan Graham, Association for Decentralised Energy

6.1 The Association for Decentralised Energy (ADE), formerly the Combined Heat and Power Association, is an industry membership body, which brings together parties interested in combined heat and power, district heating and cooling, and demand side energy services. The ADE has over 90 members, ranging from industrial and heat supply companies to local authorities, including Birmingham, Nottingham and Southampton. The ADE believes that combined heat and power and district heat at all scales and with all fuels has the ability to reduce users' bills and carbon emissions compared to the separate generation of heat and power.

6.2 Jonathan advised the Committee that, whilst the UK was lucky to have cheap natural gas, this would not last forever. Alternative sources of providing heating needed to be found, and there was an impetus to decarbonise heating. There was a role for communal heating systems within this framework. He reported that, whilst communal heating systems were more popular in other European countries, registered social landlords and local authorities in the UK have long implemented communal heating systems in new and regenerated developments, and are increasingly interested in doing so; communal heating now provides 2% of UK heat.

6.3 Communal heating is technology neutral in that it can work with a number of energy sources including woodchips, bio-oil, bio-gas and solar energy but that most systems tend to rely on gas. He also advised that, when done correctly, communal heating has a number of benefits over traditional methods of generating heat including: being able to utilise a wider range of heat generation technologies; generating heat more efficiently, lowering energy costs; reducing labour and maintenance costs; reducing CO2 emissions; creating security of power supplies for growing communities and directly tackling fuel poverty and cold homes.

Design

6.4 In terms of the design of communal heating systems, the Committee were informed that the Association believe that transparency and fairness should be the driving principles of decentralised energy provision. Jonathan reported that whilst the GLA had previously published information suggesting that 500 was the minimum number of units to make a communal heating system viable, the ADE has several case studies available which show systems could work efficiently with as few as 16 flats. Some communal heating system case studies submitted by the ADE to the Committee are attached at Appendix A.

Implementation

6.5 The ADE believes that district heating systems which (a) supply a mix of residential, public and commercial buildings and (b) are combined Cooling, Heat and Power Systems, are particularly efficient as they: "have the ability to balance the supply and generation of heat, across location and over time. Over the course of the day, heat demand shifts between residential consumers to commercial, industrial and public buildings and back again. A heat network can match and manage these flows, whilst maximising the utilisation of the plant providing the heat. Demand can also be managed across seasons, with networks supporting the operation of distributed absorption cooling plants in the summer providing cooling on a significant scale[13]."

Monitoring and operation

6.6 The ADE acknowledge that communal heating systems are not without their problems. However, Jonathon believes that the South East London Combined Heat and Power plant (SELCHP) provided an example of the viability of decentralised energy schemes. He stated that common challenges included:

- The fact that modern buildings had a high level of air tightness which could lead to overheating when schemes were poorly designed or installed
- Network losses (e.g. resulting from poor insulation on pipes) which could lead to overheating and inefficiency
- The low build quality of some systems due to "value engineering[14]"
- Poor communication between the partners involved in designing, installing and operating a communal heating system
- Lack of transparency for end users (who were not always clear on what they were paying for).

6.7 It was also acknowledged that in order to maximise the benefits of communal heating and avoid future problems, each player in the system needed to be committed to building and operating systems to a high standard. The ADE believe that communal heating can be efficiently delivered, but that this had not happened consistently in every case. They are contributing a range of tools to ensure that problems are able to be addressed in the future including: An industry-wide Code of Practice, an independent heat customer protection scheme (see next paragraph), and supporting new heat network metering and billing regulations (came into force in December 2014).

[13] See: http://www.theade.co.uk/what-is-district-heating_191.html

[14] Because, increasingly, consumers do not expect their products to last a long time and sometimes actively want to replace them regularly, products are often designed to only last for a fairly short period of time. This reduces costs for both the manufacturer and the consumer. Whilst the products could be built with higher-grade components, they are not because this would impose additional costs to the manufacturer and the consumer in order to achieve a longer lifespan which no-one is demanding. A company will therefore typically use the least expensive components that satisfy the product's lifetime projections. It can be argued that the growth of this type of planned obsolescence has also seen a growth in product quality deterioration. Because the people buying communal heating systems are not the end users they do not always demand high quality, long-lasting systems so value engineering takes place.

6.8 The regulations set out a number of requirements in relation to the metering and billing of consumers to ensure, amongst other things, that standard consumption data is made available to metered customers. The regulations will apply to all new developments with communal heating systems. Existing developments with communal heating systems will not have to retrofit meters, although any new build properties connecting to an existing multi-building district energy network will be required to have meters.

Lessons that can be learnt for future developments

6.9 It was also reported that a Code of Practice was being developed between the Chartered Institution of Building Services Engineers (CIBSE) and the Association, with the aim of establishing common standards for the development of district heating[15]. These guidelines cover minimum performance levels of system operation, minimum level of heat delivered and expected continuity of service. In respect of design and build, it involves basic design parameters and future connectivity. This would hopefully ensure that future systems learnt the lessons of earlier systems. The Code is scheduled for publication in May 2015. The Committee heard that, in addition to the tools mentioned above, the ADE would work with individual organisations to offer solutions where problems had been identified.

6.10 The Committee also heard that an Independent Heat Customer Protection Scheme[16] was being developed, which could be another way of improving the customer experience. Called Heat Trust, the Scheme, is currently signing up heat suppliers and is due to be launched later in 2015. Heat Trust will set out a number of provisions related to heat supplier obligations and service standards, comparable to the quality and performance standards for regulated utilities, drawing on legislation and industry best practice. Although voluntary, the scheme will be independently operated and is being supported by government and the ADE, as an industry-led, self-regulation initiative. Any suppliers joining the scheme would need to agree to abide by the Scheme Rules and Bye-Laws, including rules on the following:

- Support for vulnerable heat customers
- Customer service
- Heat meters
- Heat Interface Units
- Heat bill and heat charge calculations
- Heat bill payment arrangements and the management of arrears

[15] The public consultation on the draft Code of Practice was issued on 28 August 2014 and closed on 9 October 2014. Its aim was to establish minimum standards for new and retrofitted district and community heating networks schemes. For further information see: http://www.cibse.org/heatnetworksconsultation
[16] For more information see: http://www.heatcustomerprotection.co.uk/index.php/the-scheme

- Complaint handling and independent complaint handling through an independent ombudsman service
- Privacy policy and data protection
- Access to a heat cost comparator, so heat customers can compare their heating costs with what they would pay on a gas network with a boiler.

6.11 Jonathan suggested other possible options to ensure high quality communal heating systems. However, he stated that any measures implemented for communal heating schemes should be implemented for all building heating measures, because all heating and efficiency measures face challenges in delivering design performance and referred to Department of Energy and Climate Change (DECC) research evidence on the performance of both biomass boilers and heat pumps. He recommended that local authorities could (a) set minimum design efficiency or loss requirements at the planning stage for all heating and efficiency measures, including communal heating schemes; and (b) use the new Code of Practice as a framework to ensure schemes meet high quality standards, whilst requiring similarly high standards for other heating and efficiency measures. Jonathan suggested that if these measures were implemented only on communal heating schemes, it would short-change residents in new developments without communal heating systems, as these residents also deserve equally high quality standards.

6.12 Following the conclusion of the Committee's review, Jonathan submitted a further paper, which can be found at Appendix D. The paper provides information: on the specific consumer benefits that the ADE believe can arise from communal heating; recent measures put in place to increase consumer confidence and trust in communal heating installations; and additional measures which the ADE feels Lewisham could implement to further improve the quality of all heating and efficiency measures, including communal heating installations in new buildings in the borough.

The view of the Committee

6.13 The Committee discussed the fact that modern buildings had a high level of air tightness. This could lead to overheating and the Committee felt that new rules relating to energy efficiency and insulation in new buildings meant that such buildings had less demand for heat and more prospect for overheating. This, it was thought, may reduce the need for communal heating systems to be installed. It was also noted that whilst the South East London Combined Heat and Power plant (SELCHP) was successful and financially viable, this was in part due to the fact that it was large scale, used waste heat, used very well insulated pipes and supplied Victorian built estates which were not air tight. Unfortunately not all communal heating systems were as large, used as well-insulated pipes, or had access to waste heat and supplied retrofitted Victorian-era estates.

6.14 Whilst the Committee welcomed the fact that new heat network metering and billing regulations that had come into force in December 2014 would help ensure more accurate and fairer billing, it was also noted that both the new code of practice for those developing communal heating systems, and the Independent Heat Customer Protection Scheme for those supplying heat via communal heating systems were voluntary.

Peter North, Greater London Assembly

6.15 The GLA is responsible for the London Plan. The London Plan requires all proposals for major developments to include detailed energy assessments as part of their submission for planning permission to demonstrate how they intend to meet the London Plan target for carbon dioxide emissions, including evaluating combined cooling, heat, and power and combined heat and power systems. In particular, the Mayor of London expects all major developments to demonstrate that the proposed heating and cooling systems have been selected in accordance with the following order of preference, as noted earlier in the report:

- Connection to existing Combined Cooling, Heat and Power (CCHP) or Combined Heat and Power (CHP) distribution networks
- Site-wide CCHP/CHP powered by renewable energy
- Gas-fired CCHP/CHP or hydrogen fuel cells, both accompanied by renewables
- Communal heating and cooling fuelled by renewable sources of energy
- Gas fired communal heating and cooling.

6.16 Peter North reported that a third of London's CO2 emissions were generated by heating; and that more energy was used to heat buildings in the UK than was used for transport or electricity generation. Therefore, in order to deliver reductions in CO2 in buildings, it was necessary to increase the energy efficiency of buildings and how the energy is supplied. In terms of the reductions required, London had a target of a 60% reduction on 1990 levels of CO2 by 2025 alongside a target to supply 25% of its energy from local decentralised sources. However, in 2011 the GLA carried out a decentralised energy capacity study and it found that London had more potential capacity than the 25% target for decentralised energy set by the Mayor.

Design

6.17 The Committee heard that there were three main categories of decentralised energy projects:

- single sites utilising small/medium CHP systems
- multi-site mixed use schemes
- area wide transmission networks with extensive heat pipe systems.

6.18 The GLA operated the London Heat Map - an interactive tool that allows users to identify opportunities for decentralised energy projects in London. The map provides spatial intelligence on factors relevant to the identification and development of decentralised energy opportunities, to allow new systems to be located in areas where they

would be able to operate efficiently. Peter suggested that densely developed areas were the most suitable for decentralised energy schemes and that area planning was an important part of enabling the future connection of new developments to existing networks. In respect of London boroughs, he noted that they could be involved in the delivery of decentralised energy projects in a number of different ways. They might choose to deliver their own schemes, or they might only act as a planning authority, facilitating delivery by others. He reported that the development of energy master plans was a long process taking around six months from start to finish, but work had taken place in 10 boroughs, not including Lewisham, to help achieve a coordinated policy.

6.19 It was reported that large scale communal heating systems (District Heating Systems) needed to be designed in a way which would make them commercially viable and bring in private sector money by attracting lending and providing a sustainable rate of return for investors. Peter felt that there was more work to be done on developing the economic case for decentralised energy schemes. He noted that councils could use funds from the public loans board, the green investment bank and the London green fund to get projects started.

6.20 In terms of designing efficient decentralised heating systems, Peter suggested that the future of heat networks would be to utilise heat lost from other processes to improve efficiency, carbon reduction and economic viability. Peter acknowledged that residential units had periods of peak demand and that schemes which incorporated commercial units were able to sustain more consistent demand.

Implementation

6.21 The Committee was informed that the GLA's EU funded technical, commercial and financial advisory service had helped develop a £300m pipeline of projects. However, the advisory support was running down so the GLA was developing successor arrangements that would operate until 2020. Two of the major projects were:

- Gospel Oak Hospital
- Islington Heat and Power scheme (Bunhill).

Phase two of the Islington scheme would seek to use waste heat from the underground and other sources.

Monitoring and operation

6.22 Peter was aware of some consumer discontent about some communal heating schemes and suggested that further analysis was required in order to understand how these problems had arisen and how they might be avoided in future. He also suggested that some work had been carried out to investigate problems with the insulation levels of

pipework in some systems, which could lead to overheating and excessive heat losses.

Lessons that can be learnt for future developments

6.23 Whilst Peter was aware of anecdotal evidence of discontent with communal heating systems, as noted above, including issues with the insulation levels on pipework, overheating and heat loss, he was not aware of the detail of these concerns because the information had not been made available to him. He acknowledged that further analysis was required in terms of some of the concerns highlighted by the Committee, including the costs associated with communal heating. In particular, he recognised that the levels of fixed charges for some systems, which remained in the summer months, despite reductions in usage, were of concern on some schemes.

6.24 In terms of overheating, Peter acknowledged that the high levels of airtightness specified in new buildings combined with insufficient natural or mechanical ventilation might lead to overheating, particularly in the summer months. This challenge is recognised in the Mayor of London's Heat Network Manual, which includes a section about overheating in communal areas. The Manual illustrates the importance of careful design and installation of communal heating systems to ensure that heat loss in communal areas is minimised. It includes these methods of minimising overheating:

- Increasing the thickness of insulation on pipe work
- Ensuring that insulation is correctly installed to the specification and inspected
- Increasing the differential between supply temperature and return temperature - this enables smaller diameter pipes to be installed reducing the rate of heat loss from pipes which is proportional to the surface area for heat transfer[17].

Peter felt that a systematic approach to reviewing successful and less successful schemes should be taken to identify key issues.

The view of the Committee

6.25 Of particular concern to the Committee was the acknowledgement that there was a general lack of evaluation of installed communal heating systems. This meant that some of the decentralised energy policies being driven by the GLA appeared to the Committee, to be without thorough evidential foundation.

[17] For further information see: https://www.london.gov.uk/sites/default/files/LHNM_Manual2014Low.pdf, p43

Robin Feeley, London & Quadrant

6.26 L&Q has 2500 homes in Lewisham, including a new development at Loampit Vale which has a communal heating system.

Design

6.27 Robin suggested that the key to ensuring the effective deployment of communal heating systems was to agree a proper technical specification, using a robust tendering process at the outset. He also stated that the cost of the assessment and monitoring work should be built into the tendering process.

Implementation, monitoring and operation

6.28 Robin suggested that many of the problems being experienced with communal heating systems were related to the ability of developers and housing associations to correctly install and appropriately configure the systems. He stated that developers were often in a position where they could 'walk away' once the project had been delivered; and it was important that housing associations demanded high quality 'aftercare' from their construction contracts, with developers being required to demonstrate the effectiveness of the schemes they had delivered.

6.29 The Committee also heard that there had been two years of 'blind push' to install heating systems, and the details of the maintenance and operation of these systems was now being unravelled.

6.30 It was also noted by the Committee that average bills for properties with communal heating systems indicated that they were not always more affordable than traditional schemes. At Loampit Vale, for example, there was a £365 annual standing charge for heating.

Lessons that can be learnt for future developments

6.31 The Committee heard that there were nine communal heating systems in L&Q's London property portfolio that were not working due to low demand, and that L&Q had launched a three-year project to look at the specification of existing systems to learn lessons for future schemes. L&Q were also subsidising some of their communal heating systems.

The view of the Committee

6.32 The Committee felt that, whilst agreeing a robust technical specification during the tendering process might help produce more effective systems, there was also a role for housing associations in making sure that what was actually delivered met the specification and performed as expected.

6.33 Members were also concerned that communal heating systems did not offer any choice for tenants in terms of how their heating was supplied.

Bertie Dixon, Max Fordham LLP

6.34 Max Fordham LLP is a consultancy specialising in engineering and construction, that has worked on a number of local authority housing developments, including projects in Lewisham such as Milton Court. They have installed and refurbished a variety of different types of heating systems over recent years.

Policy

6.35 Bertie reported that whilst the general convention since the 1980s had been to fit individual boilers when constructing housing developments, in the last 10 years there had been a move to fitting communal heating systems. He felt that this was due to the very strong policy position that had developed which held that combined heat and power was the most efficient way to generate heat. He stated that the GLA and, in turn the London boroughs, now all but required communal heating systems in major housing developments and strongly encouraged combined heat and power. Whilst the option remained for housing developers to build more energy-efficient properties and not install a communal heating system, the policy was loaded against this. Installing communal heating systems was generally a cheaper option than providing a greater level of insulation, especially given the unrealistically low heat loss figures for communal heating provided in the Government's statutory calculation method (the Standard Assessment Procedure (SAP) 2012). The pressure from planning authorities to install communal heating has made not installing it a greater planning risk. Therefore, in his opinion, a policy which encourages communal heating, discourages inherently energy efficient buildings.

Design

6.36 Bertie suggested that a key issue was that policymakers did not seem to be aware of how inefficient communal heating systems in current UK practice could be. Whilst the design of the systems on paper might look efficient, in practice there was a performance gap. He also wondered if policy makers were aware of some of the problems that social housing tenants were experiencing with these systems and suggested that small scale communal heating systems were often not worthwhile

Implementation

6.37 Bertie reported that the Government-published calculation methods used for building control and planning stated that there was a 5% loss in energy with communal heating systems. However, Max Fordham LLP's own calculations suggest that for new flat developments, the loss was more like 50%-70%. Whilst losses as low as 30% were possible, this usually only occurred with unusually high standards of design and installation. The effect of this is not only higher carbon emissions as

more energy than predicted is used, but significantly higher bills for consumers, than one would predict using the government calculator. Furthermore the uncontrolled heat loss in the distribution system could cause overheating in buildings with attendant health risks to the residents.

Monitoring and operation

6.38 The Committee heard that with communal heating systems, the capital costs were substantially higher than in traditional single-boiler set ups, due to the increased level of infrastructure. In addition, running costs could be higher due to the increased fuel used (due to heat loss) and the required maintenance and management of the system. In Bertie's experience, bills were generally much lower for the tenant with a single boiler system in their dwelling. It was noted that Max Fordham had presented an analysis to the GLA in 2012 which suggested that district heating could cost around twice as much to operate than gas combi boilers.

Lessons that can be learnt for future developments

6.39 Bertie suggested that those installing communal heating systems should publish the estimated efficiency performance figures for the system at the planning stage and then again post implementation, during operation, to make any performance gap issues public.

6.40 Max Fordham LLP also presented some further written evidence to the Committee after its evidence session, which outlined some proposals to progress Lewisham's policy on communal heating systems (Appendix B). The proposals included changing Lewisham's present planning policy that asks for major schemes (with 10 units or above) to consider the installation of a communal heating system (although in the opinion of the Council's planning officers, this would require the Council's core strategy to be changed in a way which would place it in contravention with the London Plan, which might cause issues when the strategy was examined by the Planning Inspectorate). Another proposal put forward by Max Fordham LLP was to ensure that the price that a resident pays for heat from a communal heating system is capped at an appropriate level. A third proposal would be for all planning applications to be accompanied with a realistic projection of carbon emissions based on accurate calculated assessments of the system losses.

6.41 Should the third proposal be followed, Max Fordham LLP recommended that the metered efficiency of communal heating should be calculated & submitted pre-planning and pre-occupation. Lewisham Council should commission an engineer to comment on the submitted metered efficiency calculations and efficiency performance calculated from meter readings should be reported after one year, based on metered data. Lewisham Council should then publish these calculations and measurements.

6.42 As noted earlier in the report, the requirement for metering has been recently introduced in national legislation. The legislation requires fair metering and billing for new and existing communal heat customers. Max Fordham's view is that the legislation would have a greater chance of achieving its intended outcomes if Lewisham policed the viability tests with an expert eye and required reporting of the data. This would not only benefit the residents of the scheme in question, but the shared data would bring greater transparency to the sector, which would, in turn, benefit the wider borough.

The view of the Committee

6.43 The Committee noted the evidence given about the relationship between energy efficient buildings and wasteful heating systems which could result in overheated buildings and expensive heating bills for residents. Members asked what Max Fordham's engineers believed to be the way forward with CHP systems and noted that the principal answer was that there needed to be greater clarity and understanding about the complexity of these systems. Furthermore, in Max Fordham's view, 4500 hours of effective demand are needed to make CHP systems viable – whereas 1450 hours of demand would be more usual on a mid-sized scheme.

6.44 The Committee noted that Max Fordham's engineers believe that buildings should be built to a higher sustainability standard to achieve desired carbon savings; instead of building to code 4 standards, code 6 would be a better capital investment and deliver greater carbon savings in the long term.

James Gallagher, Parkside Residents' Association

6.45 The Parkside Residents' Association has a number of concerns about the communal heating system installed on their estate and complaints from estate residents helped trigger this review. Parkside is a phased regeneration of the Heathside and Lethbridge estate in Blackheath. Phases 1 and 2 are complete, with further phases being built.

Design

6.46 James told the Committee that, according to his own estimations, the cost of putting in communal heating systems for the number of new housing developments planned for London over the next 20 years would be in the region of £2bn; and that he felt that this money could be put to better use. He suggested that communal heating systems were best utilised in high demand environments, where they could be in use 24 hours a day, 7 days a week, which was not the case in small residential housing schemes. He reported that, according to the Carbon Trust document: 'Introducing combined heat and power[18], communal heating systems need to be in use for approximately 4,500 hours a year to be energy-efficient. The communal heating system in Parkside is only in use for approximately 1400-1750 hours a year.

6.47 James also reported that, when designing communal heating systems, housing associations and developers tended to focus on the capital costs to them and not the ongoing costs to the consumers in terms of bills. In particular, he felt that 'Whole Life Costs' needed to be taken into consideration.

Implementation, Monitoring and operation

6.48 James reported that residents at Parkside had been told that the cost to them of the communal heating system would be approximately £2-3 a week, which was a factor in many residents choosing to stay in Parkside post-redevelopment. However, the cost to residents had worked out to be in the region of £8-9 a week, a significant increase in what they were originally quoted. It was his belief that communal heating systems could add as much as £400 a year to energy bills, once you included the tariff, operational depreciation and replacement costs. Thus whilst some landlords were installing communal heating systems on the premise that tenants' energy bills would be reduced, in many cases there was actually an increase in overall bills.

Lessons that can be learnt for future developments

4.49 James Gallagher stated that it was his belief that communal heating

[18] See: http://www.carbontrust.com/media/19529/ctv044_introducing_combined_heat_and_power.pdf

systems were not the best way to achieve carbon reduction objectives due to their inefficiency; and that they did nothing to help in reducing energy poverty.

The view of the Committee

6.50 Given that the Carbon Trust has calculated that communal heating systems need to be in use for approximately 4,500 hours a year to be energy-efficient, the Committee was alarmed to hear that they were being installed in developments in Lewisham where they were used for far fewer hours. This suggested to the Committee that such small scale systems were not effectively reducing the use of carbon and that the costs of running such inefficient systems was likely, at some stage, to be passed on to residents.

Brian Regan, Planning Policy Manager, LB Lewisham

6.51 Brian advised the Committee that Lewisham Council's policy was to ask for major planning schemes (with 10 units or above) to consider the installation of a communal heating system, in conformity with the London Plan. It was noted that a number of developments in Lewisham had communal heating systems and that the largest to date was the decentralised energy scheme at the Renaissance development in Lewisham Gateway. The project covered 800 homes, as well as the Glass Mill leisure centre and a local primary school. There were also plans to widen the district heating system which utilises the heat produced by the SELCHP plant in north Lewisham as well as in Southwark.

6.52 Brian reported that consumption of energy in Lewisham's households was the borough's single largest source of CO2 emissions. Nationally 60% of the energy used in homes is used for heating, so increasing the energy efficiency of heating has the potential to bring about a significant reduction of carbon emissions. As recognised by the Committee in its damp and mould review, efficient affordable heating can also help to alleviate the problems caused by condensation, damp and mould. Communal heating was one way of making heating more energy efficient, at least on paper.

Monitoring and operation

6.53 Brian stated that the Council recognised that the levels of fixed charges for some communal heating systems, which remained in the summer months despite reductions in usage, were of concern.

The view of the Committee

6.54 The Committee was concerned at the speed at which communal heating systems were being deployed in the borough, despite signs that there were problems. Members were very keen that lessons be learnt from the experiences of implementing communal heating systems to date, especially the importance of good planning, technical expertise and robust project and contract management.

Additional Information

6.55 Outside of the formal Committee cycle, Councillors Handley and De Ryk held a further meeting with Brian Regan and also met with John Miller, Head of Planning and Tony Mottram, Head of Regulatory Services (responsible for building control). The purpose of these meetings was to discuss in more detail some of the issues raised in the evidence sessions. The following key points arose from these meetings:

- Overheating has been an issue in new build developments. New residential buildings are built to high standards of air tightness and communal heating systems can therefore result in overheating in new builds if there is inadequate ventilation. Communal heating systems retrofitted to Victoria era housing developments are less likely to have this particular issue, as the buildings are not airtight and have greater thermal mass, providing "inertia" against temperature fluctuations.

- Cooling a building can be expensive. It takes significantly more energy to reduce the temperature of a building by one degree than it takes to raise it by one degree.

- There is no legal requirement for communal heating systems to be tested to assess whether they are performing to their manufacturer specifications, resulting in a gulf between how communal heating systems appear on paper and how they function in practice. Building Inspectors check that systems have been installed correctly and are functioning correctly but do not check the actual performance of communal heating systems. In reality there is a performance gap between energy installation standards and actual performance and it would not be unusual for actual performance to be 50 per cent of the specified standard[19]. Developers are interested in compliance, not performance. More information on performance gaps is outlined below.

- Developers do not have to use Council Building Inspectors, they may choose to use a private Approved Inspector instead[20].

6.56 The Head of Regulatory Services outlined the basic process that was followed in terms of assessing the carbon emissions generated by communal heating systems, from a building control perspective:

- At the design stage the developer would submit an energy assessment in accordance with the government's Standard Assessment Procedure (SAP) 2012.
- The assessment would be created using Government approved software which would ensure the various elements of the development resulted in the required overall target emission rate.
- The assessment would be produced by a registered energy assessor appointed by the developer.
- During construction, revisions can be made to the specification. At the conclusion of work the energy assessor would produce a new assessment incorporating the 'as built' details. The emission rate

[19] For further information see: http://www.zerocarbonhub.org/current-projects/performance-gap
[20] Approved Inspectors are companies or individuals authorised under the Building Act 1984 to carry out building control work in England and Wales. The Construction Industry Council (CIC) maintains and operates the Approved Inspectors register and is responsible for deciding on the appointment of Approved Inspectors. For further information see: http://www.cic.org.uk/.

would have to be less than the Target emission rate. This assessment is then submitted to the Building Control Body.

- Building control officers (either Council or private) check that the construction is in accordance with the plans and specification. However they cannot realistically assess the performance levels of plant or machinery.

The Performance Gap

6.57 The potential gap between design and 'as-built' energy performance undermines the role of buildings in delivering the national carbon reduction plan, presents a reputational risk to the housebuilding industry and, if energy bills are higher than anticipated, damages consumer confidence. In response to this, the Zero Carbon Hub[21] was commissioned to review evidence for the significance of this gap, explore potential reasons for it and set out proposals to address these reasons. The review looked at all stages of the housebuilding process and included:

- A literature review in which nearly 100 reports were reviewed in detail
- A housebuilding process review where various sites were reviewed through interviews, a study of design information and site visits
- Standard Assessment Procedure (SAP) audits to investigate errors in SAP assessments and differences between the SAP assessments and site observations
- A SAP Assessor Accreditation Organisation questionnaire to understand the training, examination and continual professional development regimes and to identify common areas of assessor errors found at audit
- A SAP Assessor questionnaire to which around 150 assessors responded, providing information on how they typically work, what information they are provided with, what challenges they face and where a Performance Gap might occur.

6.58 Their review has revealed widespread evidence of a performance gap across all stages of the process of providing new homes, as set out in their final report, published in March 2014[22]. The report states that "clear evidence was found in the Literature Review of inadequate understanding or consideration of services design, particularly in relation to their integration with building fabric, and to system integration for more complex or less common technologies such as heat pumps, MVHR (Mechanical Ventilation Heat Recovery systems) and district heating systems." The Zero Carbon Hub's audits of SAP assessments also found that "some component of the heating system

[21] The Zero Carbon Hub was established in 2008, as a non-profit organisation, to take day-to-day operational responsibility for achieving the central government target of delivering zero carbon homes in England from 2016.
[22] See: http://www.zerocarbonhub.org/sites/default/files/resources/reports/Closing_the_Gap_Between_Design_and_As-Built_Performance-Evidence_Review_Report_0.pdf

was varied on almost every site, windows were frequently substituted, some ventilation systems were changed and lintels were substituted" with implications for actual performance.

6.59 The Committee notes the Zero Carbon Hub's finding that immediate, co-ordinated, pan-industry activity is needed to trigger a cultural shift for as-built performance to become a core element of high quality new housing. They have outlined the actions which they think need to take place:

Priority Actions for Industry

To commit to providing the investment for:

1. Performance Assessment R&D: Undertake the research and development necessary to create innovative testing, measurement and assessment techniques to understand the Performance Gap and develop commercially viable methodologies acceptable across industry for 'demonstrating performance'.

2. Skills and Knowledge Development: Ensure that as-built energy performance knowledge, including learning from ongoing research and development, is embedded into training and up-skilling for professionals and operatives.

3. Construction Details Scheme: Develop an industry owned and maintained Construction Details Scheme providing 'assured' as-built energy performance for the most common major fabric junctions and systems.

4. Continued Evidence Gathering: *Support further evidence gathering processes and coordinated feedback to ensure accelerated continual improvement across all sectors of industry.*

Priority Actions for Government

To accept the Zero Carbon Hub's recommendations to:

1. Signal Clear Direction: Clearly indicate that, in place of immediate additional regulation, it expects the construction industry to act now and have put in place a number of measures to ensure that the energy Performance Gap is being addressed and to demonstrate this by 2020.

2. Stimulate Industry Investment: Signal their long term intent, by funding research and development into testing, measurement and assessment techniques with immediate effect, to support the industry in providing the information necessary to quantify the Performance Gap and create the learning loops required to drive continuous improvement. Additionally, provide pump prime funding to enable industry to develop a Construction Details Scheme.

3. Strengthen Compliance Regime: Take action by 2016 to ensure that the Zero Carbon Hub recommended revisions to energy modelling practices, SAP processes and verification procedures, together with a strong regime to ensure that only suitably qualified persons carry out energy modelling and assessment, can be put in place.

4. Support Skills & Knowledge Development: Accelerate the demand for industry developed qualification schemes by requiring energy certified operatives and professionals for developments on public land from 2017.

Vimal Bhana, Barratt Homes; and Jeremy Bungey, E.ON

6.60 The Committee heard that E.ON currently operates 28 communal heating systems in various types of housing developments across the country. It was E.ON's view that, when designed, constructed and operated correctly, communal heating systems could deliver value for money for residents without compromising on service and protection whilst also delivering significant carbon benefits. The Committee heard that there were currently over 5,500 Barratt Development customers connected to a district heating network run by E.ON, which would increase to over 13,500 when all current schemes were fully built out. It was reported that the following Barratt's developments in Lewisham had communal heating systems:

- Cannon Wharf – 679 units + 14 commercial units & business centre.
- Catford Stadium – 588 units + 2 retail units & a community centre.
- Loampit Vale – 794 units + a leisure centre.

Design

6.61 In discussion, the Committee heard that it was difficult to determine a 'minimum' amount of properties required to make a communal heating system viable. However, it was Vimal's view that depending on the density of properties, there would generally be more benefit for the customer in terms of costs, and more benefit for the environment, in terms of energy saving, if there was a minimum of 250 properties for a high-density property scheme, and a minimum of 800 for a terraced property scheme. Jeremy felt that, from E.ON's perspective, the smallest viable communal heating scheme would be about 120 homes and a leisure centre, or between 300-500 homes.

6.62 It was also reported that the larger the number of properties attached to a communal heating system, economies of scale would indicate that the more benefits would accrue in respect of cheaper energy costs and less wasted energy. The witnesses also felt that, operationally, communal heating systems were at their most efficient when they captured 'waste heat' and recycled it (such as at SELCHP). Having a diverse mix of properties in the heating system, like leisure centres, or swimming pools, that used heat and power throughout the day as opposed to residential units which tended to use more in the evenings, also helped.

6.63 Jeremy suggested that if a developer such as Barratt's wanted to use an Energy Services Company (ESCO) such as E.ON to run a communal heating system, it was important to make the decision early in the process so they could be involved in the design.

6.64 It was further noted that individual metering of properties and block-level metering is a requirement for new housing developments

incorporating communal heating systems from April 2015 under the EU Energy Efficiency Directive (2012/27/EU)[23].

Implementation

6.65 Jeremy and Vimal, as part of their evidence, reported to the Committee that some of the challenges they had encountered in respect of the delivery of communal heating systems were:

- Installing the best equipment for the communal heating system.
- Managing demand throughout the day.
- Installation of adequate heat storage and back-up boilers where necessary.

6.66 It was also noted that residents at Loampit Vale had the option of opting out of the communal heating system but there would be infrastructure costs that they would have to meet, such as the cost and installation of an individual boiler.

Monitoring and operation

6.67 The Committee heard from Vimal that, according to his calculations, the average Barratt customer communal heating bill was approximately £500 per year and the average carbon saving on heat produced during 2014 was 30%, compared to a gas boiler. The average cost of heating a property in the UK including a full maintenance and replacement service, based on market data, was approximately £1,000-£1,100 a year. It was also reported that E.ON and Barratt had worked closely over a number of years and they endeavoured to provide exemplary customer services to their residents, which included, for example, a 24-hour/7-day a week call-out service.

6.68 The Committee heard that Barratt's Dalston Square development had experienced some overheating issues post installation. The issue had been addressed with ventilation, distribution design techniques and employing different types of heat exchangers. The Committee was told that Barratt's employs staff on-site in their major developments, for an intermediate period after completion, for after-care services, to deal with any major issues that occur.

Lessons that can be learnt for future developments

6.69 Both Vimal and Jeremy stated that their companies had experienced a steep learning curve with communal heating systems and ensuring that everyone involved had the necessary expertise was vital.

[23] For further information see: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/270545/Decc-consultation-EED_heat_metering_and_billing_-_FINAL_100114.pdf

6.70 The Committee heard that E.ON and Barratt were involved in the Steering Group for the Department of Energy-sponsored 'Independent Heat Customer Protection Scheme' referred to in the evidence from the ADE; and that they saw this scheme as a precursor to a statutory scheme in the future, once communal heating systems expanded in use.

6.71 Jeremy stated that E.ON had learnt a number of lessons from their experience of working with communal heating systems, which were as follows:

- The importance of early consideration of operating and billing requirements
- The importance of early consideration of Customer Protection requirements
- The fact that the system needs to work for every single customer and needs to be designed to do so
- The fact that things tend to go wrong with setting up the automatic meter reading (AMR) and control systems – and these things need to be dealt with promptly
- The importance of ensuring that the low carbon technology actually works as projected
- The importance of communicating with customers at the earliest possible stage.

6.72 Vimal informed the Committee of the challenges and lessons learnt by Barratt's:

- The importance of informing the customer about what a communal heating system is and how it operates, alongside all the information they receive whilst buying a home (Barratt's have developed their training of staff so they are able to provide customer-friendly information on communal heating systems).
- Making sure customers are aware of Landlord and Tenant Act Provisions in relation to their property (See below).
- The importance of abiding by the requirements set out in the Independent Heat Customer Protection Scheme.
- Whilst communal heating systems can be good at producing low carbon heat and power, they can emit Nitrogen Oxide (NOx) which is an irritant gas that, at high concentrations, causes inflammation of the airways. The installation of ultra-low NOx boilers reduces the impact considerably but these have a shorter life-span than most other boilers.
- It should be ensured at the design stage that communal heating systems do not cause overheating, although overheating can be mitigated at a later date once the causal factor has been identified.

6.73 The witnesses felt that the Department of Energy-sponsored 'Independent Heat Customer Protection Scheme' would be useful in

providing customers with some protection in a fairly new industry. Under the voluntary scheme, suppliers must provide customers with transparent heat charge calculations, indicate how prices might change in the future and provide an industry-wide heat charge comparator. E.ON and Barratt had been involved in developing the scheme and would join it.

The view of the Committee

6.74 The Committee noted, in relation to Loampit Vale, the importance of the swimming pool in ensuring consistent demand for the communal heating system and recognised that having a balance of residential and non-residential buildings in a communal heating system was crucial to ensuring its efficiency. The Committee also noted that communal heating costs were often split between standing charges (based on operation and maintenance costs) and usage charges (based on the amount of heat used in each accounting period) and that housing associations needed to make sure that they understood the proposed tariffs and the cost implications for their tenants.

The Landlord and Tenant Act 1985

6.75 Sections 11, 18, 19 and 20 of the Landlord and Tenant Act 1985 have an impact on the development of communal heating systems. Section 20 of the act requires a landlord to consult leaseholders, tenants and recognised residents' associations before entering into a qualifying long-term agreement (QLTA) such as the agreement between a landlord and an Energy Services Company (ESCO) if it lasts more than 12 months and if a resident's contribution to the cost arising under the agreement is more than £100 per year. Although there is a five-year exemption from the obligation to consult in the event that a QLTA is entered into before any tenancy agreements or leases (or contracts for sale) are in place, most agreements signed between developers and ESCOs are for more than five years.

6.76 Section 11 of the act requires landlords to 'keep in repair and proper working order the installations in the dwelling house for space heating and heating water' and this maintenance cost is deemed to be included in the rent. This means that any communal heating charges relating to the landlord's maintenance obligations should be separately identified and charged to the landlord (rather than the tenant as part of the heat charges).

Visits to Bunhill Heat and Power, Pimlico District Heating Undertaking (PDHU) and SELCHP

6.77 Visits were arranged for the Committee to three Communal Heating Systems: Bunhill Heat and Power in the London Borough of Islington, Pimlico District Heating Undertaking (PDHU) in the London Borough of Westminster, and the South East London Combined Heat & Power (SELCHP) in Lewisham and Southwark. The visits gave Committee members an opportunity to see systems in practice and speak to those responsible for their operation.

Bunhill

6.78 The Bunhill District Heat and Power network is run by Islington Council and provides heat to approximately 850 homes and two leisure centres. The project aims to reduce energy costs for residents, reduce carbon emissions and improve the security of heat supply for connected residents. The heat network consists of two parallel pipes, one carrying hot water from the energy centre (where heat is generated via a gas-fired 1.9MWe engine) to buildings on the network and the other returning the cooler water back to the energy centre (a 'flow and return' system). Each building on the network has a boiler house where heat is transferred by a plate heat exchanger from the heat network to existing central heating systems that then carry the heat around the buildings. Essentially, the hot water from the district heating network is on one side of a metal plate and the water in the communal heating system of the block being supplied is on the other. This means the water in the two systems is kept separate (hydraulic separation) and no extra pumping is required (the water in the communal system is pumped around anyway). The energy centre produces both heat and power and selling electricity to the national grid enables Islington Council to give a 10 per cent discount on energy costs to its tenants. The £3.8 million energy centre and heat network were funded by grants secured from the Greater London Authority and the Homes and Community Agency.

6.79 In terms of designing the district heating system, the inner-city environment presented many challenges from tight infrastructure, lack of space, noise considerations and air-quality considerations. Islington Council undertook up-front work wherever possible to reduce the project risks and minimise uncertainties during the construction phase, including the design and application for planning and underground surveys. A design and build contract was then commissioned (and subsequently awarded to Vital Energi) alongside a 10 year maintenance contract to provide assurance to the council. The scheme is currently being expanded to supply the King Square estate and other properties adjacent to this. This will see approximately 1000 more properties connected. Construction has started, with testing and tuning due to run in 2016/17. Full operation of the system is planned to begin in 2017.

6.80 The following observations were made on the visit:

- The homes were not metered - temperature within homes was controlled via individual radiators rather than switches or meters on the wall.
- Hot water was provided 24 hours a day. Hot water consumption was not currently monitored as the older buildings connected to the network did not have water meters. Because of this, all residents were charged a fixed amount for hot water (approximately 70p per day).
- Residents seem to be more content when their communal heat and hot water is paid for via a fixed addition to their rent.

Pimlico District Heating Undertaking

6.81 Pimlico District Heating Undertaking (PDHU) is a communal heating system owned by Westminster City Council and managed by CityWest Homes, an Arms-Length Management Organisation (ALMO). It provides heating and hot water to 3,256 homes (mainly Victorian era blocks), 50 commercial premises and three schools. The system was built over 50 years ago and originally used waste heat from Battersea Power Station. The PDHU was upgraded in 2006 with the construction of a new energy centre which included two 1.55MW electrical output combined heat and power (CHP) and three 8MW gas fired boilers, enabling it to heat an additional 1,400 homes. The operators believe that this enables the system to save 3,000 tonnes of carbon dioxide each year – the equivalent of taking 1,000 cars a year off the roads of London. PDHU operates with a thermal efficiency of 84%. This is because most of the heat produced by the CHP engines is extracted and fed into the district heating system.

6.82 Those on the visit were informed that:

- The costs of the system were covered by the service charge paid by those connected to the system, and by earnings from selling energy to the National Grid (approximately £1m of electricity was sold to the National Grid every year). The system was not-for-profit.
- There was a very pro-active PDHU User Group.
- Residential properties paid a service charge for their heat – there was no individual metering of properties. Currently heat was being sold at 5 pence per kWh and the last increase in price was in 2011.
- Residents were asked to agree a short Heat Supply Agreement to sign up to PDHU. Individuals were able to leave the heating system; however no-one had requested to leave as yet.
- The PDHU had access to back-up, oil-fired boilers, although they had rarely been used.
- PDHU operated the largest thermal store in the UK – a tower storing 2,500 tonnes of hot water - so that heating could still be

supplied in the event of problems with the generating system. The store also helps to smooth out peaks and troughs in demand.

- The operators estimated that there was approximately a 7% loss of heat in the residential blocks.
- Challenges that needed to be considered in relation to the PDHU included:

  - The very high capital costs – the plant, the pipeline, putting in block or individual metering
  - Tax issues - PDHU residents were subject to carbon tax and the European Union's emission tax – the operators felt that more work needed to be done on the establishment of fair taxes in this industry.
  - Noise issues - communal heating systems require large fans to cool the engines that run the systems
  - The limited availability of skilled and dedicated staff
  - Water treatment - the water used for communal heating systems needed to be treated to protect the copper pipes used in the system.

South East London Combined Heat and Power (SELCHP)

6.83 SELCHP is a waste incineration plant which has started to use its waste heat to produce hot water and electricity. SELCHP was commissioned in 1994 to incinerate household waste and also generate electricity and heat if economically viable. It was designed to be 'communal heating system ready' with an area within the building designated for heat supply equipment. The refuse is burnt at temperatures greater than 850°C which creates heat energy which is released into a multi pass boiler[24] where 76 tonnes of steam per hour is produced. The steam drives a turbine which rotates a generator to produce electricity for export to the National Grid. Steam from the turbine is also sent to a heat exchange to provide heat to 16 residential blocks (mainly Victorian era) in the London Borough of Southwark (made up of approximately 2,500 residential units). The heat for these estates is sent to four boiler houses where heat exchangers transfer the heat to the blocks' original pipe system. The boiler houses pump hot water through buried distribution pipes to each residential block via plant rooms that house heat exchangers/calorifiers to transfer heat into local systems for distribution to the residential units. The boiler houses also act as back up boilers during limited periods when SELCHP is offline.

6.84 Those on the visit were informed that:

- In 2012 Southwark signed a PFI contract with Veolia to run the plant.

[24] A multi pass boiler directs flue gases through multiple combustion chamber passes, extracting the maximum amount of heat out of the hot boiler flue gases.

- There are approximately five kilometres of underground pipes which supply the 16 residential blocks, all within a 2km radius of the SELCHP station.
- The operators estimate that they only have one per cent heat loss from their pipes as a result of the use of exceptionally high grade pre-insulated pipes.
- Southwark Council reports that using SELCHP has provided a 10% saving on energy and maintenance costs and the long term nature of the contract (20 years) means the Council knows what it will be paying in the long term, and is not subject to energy price fluctuations.
- Southwark Council reports that it is able to provide cheaper energy costs to their residents as a result of the long term contract.
- Southwark is looking to expand the system and is currently in on-going dialogue with five or six developments in the area. SELCHP is able to expand in any direction provided that there is a sufficient load (i.e. residential units) to supply to.
- 1km of underground pipe costs approximately £1.3 million to lay, meaning that there would need to be a certain number of residential units included in any expansion to ensure viability.
- SELCHP were interested in the Surrey Canal "New Bermondsey" development in the area close to Millwall Football Club, and had identified it as an area that could be linked to their system.
- SELCHP was heavily regulated by the Environment Agency to ensure that strict emissions restrictions were met.
- There had been a number of legal issues that had needed to be overcome in relation to the contract, centring on whether the Council or Veolia was responsible for any problems connecting the new system to the old system.

6.85 Those on the visit felt that SELCHP was particularly successful because it used 'waste' heat to provide hot water which would otherwise be going into the atmosphere.

The Which? Report

6.86 Following the Committee's final evidence session, Which? Magazine produced a report on district heating looking at the consumer experience: "Turning up the heat – getting a fair deal for district heating users".[25]

6.87 The report raises concerns about whether communal heating systems offer consumers a fair deal, noting that, unlike the majority of UK homes that are connected to mains gas, district heating schemes are not regulated so many customers have no opportunity to switch suppliers or the right to redress should the service they receive fail to meet their expectations. Which? conducted a series of focus groups and telephone interviews to better understand consumer concerns, and looked at price data from more than 50 schemes supplying heat to around 87,000 households. Their investigation found examples of:

- Estate agents not being up-front about heating costs meaning that prospective tenants were given inadequate information, or even misled, before moving in.
- Long term contracts meaning customers could not switch suppliers.
- Difficulty in working out whether heating bills were fair and accurate, fuelled by unclear billing and doubts over how efficiently schemes were being run.
- Consumers being let down by poor customer service and complaints handling, with many having no access to Ombudsman schemes or independent redress if things go wrong.

6.88 Which? believes that:

- Homebuyers and tenants need to be given up-front, clear and accurate information about their scheme including price details.
- A single organisation should be made responsible for consumer complaints and all communal heating consumers given access to an independent Ombudsman.
- An independent and tailored heat price comparator should be developed so consumers can compare their heating costs against other schemes.

[25] See: http://www.staticwhich.co.uk/documents/pdf/turning-up-the-heat-getting-a-fair-deal-for-district-heating-users---which-report-399546.pdf?utm_campaign=whichnews&utm_medium=social&utm_source=twitter&utm_content=Energyefficiencyreport143501042015&utm_term=twnews

7. The Committee's findings

7.1 Having considered the evidence presented to it during the course of the review, the Committee drew a number of conclusions about communal heating systems and their operation in Lewisham.

7.2 It is the Committee's opinion that scale and balance is crucial. Communal heating systems need to be large enough to benefit from significant economies of scale; and serve a mix of residential and commercial properties, which will have more balanced heat and power requirements, spread over 24 hours, than residential-only schemes. Systems that use waste to create heat and power have the ability to be more economical and carbon efficient.

7.3 The policy push towards communal heating systems gives the impression that they are the only way of achieving required carbon reduction targets in the housing sector, meaning that other avenues of reducing the carbon footprint of new housing developments such as building new properties to a higher standard (e.g. ultra low energy buildings which require no heating) are not being explored.

7.4 There is a gap between how communal heating systems appear on paper and how they function in practice. Building Inspectors are not required to check the actual performance of communal heating systems, instead relying on the heat loss figures for communal heating provided in the Government's statutory calculation method, which many feel are unrealistically low. The Committee heard that in reality there is a performance gap between energy installation standards and actual performance and it would not be unusual for actual performance to be 50 per cent of the specified standard. This means that carbon saving calculations are likely to be considerably inaccurate, which in turn casts doubt on the validity of the rationale underlying the policies that encourage the installation of these systems.

7.5 Whilst EU, national and regional policy is championing the installation of communal heating systems, relatively little evaluation has been carried out as to how these systems are working in practice, both in terms of carbon reduction (taking into consideration the performance gap) and consumer satisfaction. The recent Which? Report suggests consumer dissatisfaction in a large number of instances. In particular, communal heating systems remove the freedom of choice from residents, who are unable to choose their own energy supplier and who are effectively required to sign up to a monopoly.

7.6 Communal heating systems can be expensive in practice and costs are often passed on to the consumer. Some of this is due to the high levels of heat loss that can occur. If not well insulated, the long pipe runs used in communal heating systems result in heavy heat loss and this increases costs (as well as causing overheating). The one per cent heat loss achieved by SELCHP is as a result of the use of exceptionally high

grade pre-insulated underground pipes. Such insulation is not being used on the systems being installed in smaller residential developments.

7.7 Communal heating systems often require subsidies to keep them 'affordable' for residents, although what is 'affordable' is subjective and many residents do not feel that their subsidised systems are affordable. Once the subsidies are removed, residents may be faced with much higher bills, often higher than they would have received under a traditional, non-communal system.

7.8 Overheating appears to be a particular issue in many residential communal heating systems, with planning requirements in relation to ventilation sometimes being 'downgraded' following 'expert' mitigation on the behalf of developers. In addition to being unfair on residents, overheating also wastes carbon and even if it is effectively tackled, it can be costly: it takes more energy to reduce the temperature of a room than to increase the temperature.

7.9 A number of witnesses giving evidence to the Committee at evidence sessions or on visits mentioned that lack of expertise amongst staff at every level was an issue. To be successful, communal heating systems need to be expertly planned, delivered, maintained and monitored. This requires those planning, installing, maintaining and monitoring such schemes to have specialised skills. The Committee believes there is currently a skills shortage in many of these areas. In particular, the Committee is concerned that many housing providers do not fully understand the systems they are having installed in their developments and are often under pressure to cut costs and therefore consultancy time. This is also particularly a concern in relation to value engineering – if you are not completely sure about what you are buying, how can you be sure you are getting good value? Housing associations need to be involved at all stages of the process, including design and specification to make sure they fully understand the systems they will be responsible for. This would help overcome some of the issues that arise from the fact that those responsible for installing communal heating systems are rarely responsible for their operation.

8. Monitoring and ongoing scrutiny

8.1 In addition to a Mayoral response, the Committee would like an update on the implementation of any agreed recommendations before the end of the 2015/16 municipal year.

Appendix A

Case studies – The Association for Decentralised Energy

First Choice Homes Oldham

First Choice Homes Oldham (FCHO) is a housing association that manages 12,000 homes. It has over 2,000 properties connected to district heating on over 50 schemes.

FCHO retrofitted heat metering equipment to its networks so that it could help its residents to better understand their energy usage and to help tackle fuel poverty.

The district heating system provides heating and hot water to the residents from a gas fired boiler on demand. Before the heat meters were installed, residents paid a fixed charge each month.

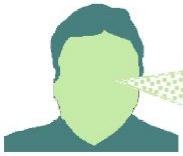
Heat meters were installed into each property, giving householders direct control over their heating and hot water consumption. Each resident now pays for what they use, rather than what is available.

Gaining 'ownership' of their energy consumption has had a positive impact on residents' bills. 9 out of 10 residents pay less now than they were doing on the standard charge with 63% reporting having halved their heating and hot water bills or more.

Billing information is collected electronically using an innovative radio device, so residents do not need to be disturbed to collect the consumption information. By only producing the amount of heat and hot water that is needed by the residents the housing association has been able to run the district heating systems more efficiently, using less fuel which has helped to reduce costs and carbon emissions.

"All I have to do is use the simple control board. It's a fantastic improvement on the old fixed charge system."

- Mr Jagger, FCHO Resident



"It was clear right away that the heat metering systems would result in reduced fuel costs for the vast majority of tenants but, critically, it would also introduce real fairness."

- Martin Latham, Heating Service Manager

Lincoln Court case study

CHP slashes sheltered housing fuel bill

A DACHS CHP unit is helping a sheltered housing complex near Newcastle cut its annual fuel bill by 30 per cent.

The CHP system, supplied by Baxi-SenerTec UK, was installed alongside Potterton MB Series modular boilers that have replaced the ageing district heating system at the 32-flat Lincoln Court building in Hebburn.

Design engineer Michael Cockram of South Tyneside Council, said he and the residents were delighted with the change.

"We are closely monitoring the performance of the DACHS and it is working 24/7 with a single stop / start per day," he said. "Power output is 5.5kW and thermal output is about 15.5kW and that is good news. Everything appears to be nicely balanced."

Lincoln Court is using the electricity produced by the CHP to supplement the landlord supplies to the corridors, common areas and the social lounge. It is also being used for security lighting, lifts and pre-heating of hot water supplies to washing machines. This has significantly reduced the amount of electricity drawn from the Grid.

Serving the mostly single occupancy flats and warden's accommodation, the DACHS is in constant demand. Each flat has a typical average trickle demand of about 200 to 500W of heat so, even during the summer; there is a need for thermal energy from the CHP, which means it can continue providing electricity all year round.

The unit acts as lead boiler to displace some of the new gas condensing boiler heat load. Each flat is fitted with an indirect Elson tank and direct acting valves are fitted to the primary LTHW mains to control the tanks. These operate around the clock.

Mr Cockram explained: "We are using them as a heat sink to export the thermal output from the CHP."

The new boiler plant is fitted with direct weather compensation that can be used for off peak heating periods.

The council is currently reading the gas meters on a monthly basis to identify operational costs and possible savings.

"Central power stations operate at around 35 per cent efficiency and conventional heating at around 80 per cent," said Mr Cockram. "The DACHS burns approximately 30 per cent less fuel than independent production of heat and electricity, reducing both carbon emissions and costs, but still produces the same total output."

www.baxi-senertec.co.uk

West Bridge Mills District Heating

West Bridge Mill consists of 16 self contained flats for vulnerable young people as well as office space for charities. Link Group Housing Association chose combined heat and power with district heating so they could provide low carbon, affordable heat and power to help alleviate the fuel poverty of its residents.

Before the renovation, each flat used electric storage heaters and immersion heaters which were inefficient, unreliable and expensive to run. Following the installation of the combined heat and power unit and district heating system, the site has **reduced its energy costs** by **£14,000** a year, **saving residents hundreds of pounds** on their energy bills.

The combined heat and power unit tracks energy demand to make sure that all of the residents' heating and hot water needs are met whatever the weather. The unit also supplies around 66% of the site's electricity demand. The new system is more fuel efficient and has helped the site to **reduce its carbon emissions by 31%.**

Each resident is able to meet their individual heat and hot water needs exactly through controls in each flat. The flats also have integrated energy meters which lets the resident check their energy consumption and lets the supplier take accurate meter readings for billing.

"We have seen a significant benefit in heating bills and found that our energy costs last year were reduced by around £14,000. The colossal energy savings made possible through this solution led to the project's recognition by the Chartered Institute of Housing awards in the Excellence in Environmental Sustainability Design category."

- Colin Reid of Link Group

The West Bridge Mill project shows how combined heat and power and district heating can help to alleviate fuel poverty. The new system is much more fuel efficient and requires less maintenance. Thanks to the new system, residents have more control over the energy they use while also benefitting from reduced running costs and cheaper energy bills.

Brownrigg Communal Heating Scheme

Brownrigg Court in Newcastle is a district heating scheme which connects the homes to 11 boiler houses.

Gentoo Sunderland chose district heating to reduce energy usage and to help tackle fuel poverty amongst their residents. It found that residents using district heating consumed less energy than those with an individual gas boiler.

The district heating system provides heating and hot water to the residents on demand. The original boilers were reaching the end of their useful life, which gave the housing association, Gentoo Sunderland an opportunity to install the latest, most efficient gas boilers to provide heat to the network.

The new boiler houses were designed and tested offsite, which kept disruption of the residents to a minimum.

The new system is more fuel efficient, which has reduced gas bills, making it more affordable for the residents. By improving the efficiency of the site, the housing association was able to make a cost saving of 22%! It is so much more efficient that it has helped the site to save 234,000 tonnes in carbon emissions!

""I have lived in this property on the communal scheme just over three years. I moved from a property with an individual gas boiler which was much more expensive. I am using less energy and spending less money which is great!"

- Helen Speed, Brownriggs Court Resident

"Communal Heating promotes a more efficient and 'cleaner' way of heating our schemes. We have found the usage of communal heating schemes to be much lower than properties on individual gas boilers being more efficient and beneficial for our residents and reducing the element of fuel poverty. Working in partnership with the energy provider we are able to support each resident and provide energy advice from both angles."

- Colin McCartney, Gentoo Sunderland

Appendix B

Paper from Max Fordham LLP

MAX FORDHAM

Lewisham Housing select committee 17/12/14

Maxfordham written comments as requested.

Contents:

MAX FORDHAM

1. **Typical heat losses from a district heating system in practice, for Lewisham Housing select committee**

'Project B':
London. Around 200 homes completed in 2007. Medium rise.
This is a typical-to-good project in terms of quality of design, massing, workmanship & maintenance. ie there are worse systems.

SAP is the official calculator used to assess the CO2 emissions to demonstrate compliance with Planning, including the London plan, and Part L.

SAP predicted useful heat demand for project B: 725MWh/yr
SAP predicted heat losses from the district heating: 10% of demand

Actual heat demand: data not available
Measured heat loss from the district heating*: 1700MWh/yr
1700/725=2.3
Measured heat loss from the district heating as a percentage of SAP predicted heat demand: 230% of demand

Conclusion:
In this instance, the losses are apparently 23x as large as the official calculation predicted.

*calculated using data from a sample week

2. Brief answers to the scope of the enquiry (in red)

SCOPE OF THE LEWISHAM HEATING ENQUIRY

For district/community heating, biomass and CHP installations:

1. What are the calculated performance figures including the operating efficiencies and losses from schemes in the borough. This should include the fuel in, electricity in, heat delivered to the dwelling or user, electricity delivered to the user and/or grid. All figures to be in kWh and CO2 based on current CO2 emission factors from the department of energy and climate change [DECC]. SAP is the official CO2 emissions calculator used to demonstrate compliance with Planning, including the London plan, and Part L. The SAP default value for district heating (DH) heat losses are typically 5-10% losses. If you actually measure the pipe lengths & calculate the loss (not required for CO2 compliance) the losses are more like 50-100%.

2. What are the measured operating performance figures from schemes in the borough to back up the calculated figures, and how are they reconciled, if at all? We have data from one scheme (not in Lewisham) as detailed above. Losses are 230% of SAP calculated useful heat demand.

3. What is the calculated overheating effect caused by heat loss from system distribution losses and losses from heat interface units? Significant. We haven't done a detailed analysis of this but our report submitted on the 17th December indicated the heat gain into the common parts from the pipework for various arrangements. To give some idea, one would fit a 1300 w radiator in a 25m2 room with external windows and walls. This would be well oversized for rapid warm up so the output would normally be much lower than this in the winter and nothing in the summer. 1300 w is the constant heat gain from the pipework into the small landing with no heat loss. Ie it is like having a reasonably sized radiator running hot all the time.

4. What are the measured temperatures in areas that are affected by heat loss from distribution pipes and heat interface units, and how do they reconcile with the calculations?

5. What is the effect of future changes to the CO2 emission factors for grid electricity on the overall carbon intensity of the heat being provided? This report suggests that district heating systems & CHP installed now will lose any carbon advantage in less than 10 years, depending on how quickly the grid decarbonises. We think it is sooner than that (ie now) because this report does not take into account the system losses which we know quickly negates any marginal benefit using the CHP heat. http://www.aecom.com/deployedfiles/Internet/Geographies/Europe/Document%20Library/heated_debate_sustainable_heat_low_carbon_future.pdf

6. What are the costs of installation operation and maintenance for the systems?

Installation:

This report written for the DECC in 2009 suggests it costs at least twice as much to build DH than gas boilers (table 35 of this:
http://www.poyry.co.uk/sites/www.poyry.uk/files/A_report_providing_a_technical_analysis_and_costing_of_DH_networks.pdf

See also figures available from James Gallagher which are less favourable to District heating.

Operation and maintenance:

We presented an analysis to the GLA in 2012 which showed that district heating could cost around twice as much to operate than gas combi boilers, potentially bringing social tenants 80%of the way to the fuel poverty threshold, for a brand new building in Lewisham.

7. How much are residents being charged for consumed kWh's, Daily Fixed Charge, Operating, Maintenance Costs & Depreciation Charges? [This item needs to be separated into two categories 1]

MAX FORDHAM

where there are heat meters installed & 2) where the heat delivered is estimated & charged as a fixed weekly amount. In 2) estimate the heat consumption of the dwelling to establish a specific cost per kWh. See figures available from James Gallagher

8. How does the advent of new highly insulated and air-tight buildings with very low heat loss affect the findings? District heating is the cheapest way for a developer to pass the targets, as it is easier to build and less stringently tested than building fabric. Therefore, by encouraging poorly regulated district heating LBL is a penalising energy saving measures such as improved fabric. This is counter to the London plan energy hierarchy, and is a fundamental conflict in that policy.

The heat losses from district heat are fixed. So, as buildings become more efficient, they become less and less suitable for connection to district heating.

9. As a comparative study, how much is the cost of a combination boiler installation in terms of Installation Costs, Fuel Costs, Operation & Maintenance Costs, and Replacement Cost? Around half of that of district heating. (ref table 35 of this: http://www.poyry.co.uk/sites/www.poyry.uk/files/A_report_providing_a_technical_analysis_and_costing_of_DH_networks.pdf

10. What are the other low energy options for providing heat to dwellings in the borough and what are the barriers to beneficial energy options being adopted? Reducing the demand through insulation and airtightness will yield a reduction in energy use. Modern construction needs very little heat at all. In these conditions it is easy to use more energy moving the heat around and loose energy with poor controls than the actual building heating requirements. Appropriately sized and well controlled conventional systems will provide savings. In time the fuel sources of gas or electricity will decarbonise at a national level. This simple approach is basically shut down in London due to the need to install district heating which needs to sell heat to be economic and stops any innovative ways to provide heat locally. Efficient use of fossil fuels; Gas heating with Passivhaus fabric standards & Passivhaus quality control; Air source heat pumps in some examples.

11. What is the effect of the costs differentials on energy poverty We presented an analysis to the GLA in 2012 which showed that district heating could cost around twice as much to operate than gas combi boilers, potentially bringing social tenants 80%of the way to the fuel poverty threshold , for a brand new building in Lewisham.

12. What are the options for making sure that residents with higher cost heating systems over other systems are not penalised. What are the options for allocating the costs differentials if the putative benefits are for the greater good of society rather than the individuals. Is this approach a defendable use of public money? The price that a resident pays for heat from a district heating system could be capped at what they would pay for an equivalent market-linked gas combi boiler. We can not identify a group who could fairly be forced to pay for these ongoing costs. If no one party is responsible, or if no one party can legally be pursued, often the council has to pick up the cost. District heating is creating a legacy which must be dealt with, usually at the tax payer's expense, much like asbestos.

Appendix C

As part of the review, Seven Registered Housing Providers in Lewisham were invited to submit some written evidence to the Committee. Hexagon Housing and Family Mosaic responded, with Hexagon Housing reporting that as an organisation they did not have much experience of communal heating except in hostels, so would not be providing a written submission. A short written submission was received from the Director of Property Services at Family Mosaic, the housing provider at Parkside (the regenerated section of the Heathside and Lethbridge estate).

Submission from Family Mosaic

I have looked at the review and I have looked at some of the key questions that are being raised. I think it is absolutely vital that Council also considers as part of this review a number of other factors:

1. What are the plans for reviewing energy price predictions over the next 10 years and comparing that to the present position. Reviewing a district heating system in isolation as opposed to a 10, 20, 30 year prediction, would be I suggest more beneficial. Housing isn't just about residents today, it is about the needs and the customer use in the future.

2. Many local authorities look at the communal heating systems as a long term strategy for a potential "network" of sites across the borough. Indeed, many local authorities have concrete plans for this. Lewisham will no doubt be looking at this for the future as well.

3. The reduction in CO2 emissions through the set up with a combined heat and power system will and does constitute a significant and beneficial change to the reduction of emissions into the atmosphere.

4. Design and operation of communal heating systems continues to evolve and the down side of these systems is that when something goes wrong, it doesn't just go wrong for one resident it can go wrong for hundreds of residents, hence exacerbating the problem. The committee might actually like to ascertain how many times individual gas boilers go down across the borough over a period of time to see just how many individual residents are effected rather than assuming that communal heating systems always produce the worst service.

5. Overheating – this is an important area and good design is absolutely vital to producing better quality systems. However, our buildings are becoming more and more "air tight" and with the push for higher density this can create problems. We are now ensuring that the design and calculations associated with potential overheating form part of the decision making process very much at the start of the scheme rather

than later on during the construction process. This of course is not only about heat levels within the flats it is also about the distribution areas such as corridors and risers.

Appendix D – Paper from the Association for Decentralised Energy

The Association for Decentralised Energy

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Bringing Energy Together

Lewisham Housing Select Committee: District heating inquiry
April 2015

About the Association for Decentralised Energy

The Association for Decentralised Energy is the leading advocate of an integrated approach to delivering energy locally, designed around the needs of the user, including with CHP and district heating. Our over 90 members include a wide range of companies and organisations, including industrial manufacturers, energy service providers, local authorities and housing associations.

We appreciate the Lewisham Housing Select Committee's ongoing concerns regarding the performance of district heating schemes in specific recent housing developments. We welcomed the previous opportunity to provide oral evidence to the committee.

Following that evidence session, we wanted to highlight:

- The specific consumer benefits of district heating;
- The recent measures which are being put in place to increase consumer confidence and trust district heating installations; and,
- Additional measures which Lewisham could implement to further improve the quality of distri heating installation and operation in Lewisham.

Consumer benefits of district heating

Every district heating customer deserves a fair deal and great service. District heating can provide significant benefits for their heat customers. Our 'Consumer in focus' case studies show how consumers can benefit from district heating, which can be read **here**. These benefits include:

- Helping to manage fuel bills.
- Reducing bills by providing residents with access to lower gas retail prices.
- Reducing maintenance costs by including only one professionally-managed heating unit to maintain. Tenants split the cost of the maintenance.
- Helping fuel poor tenants to access lower cost technologies, such as by switching tenants fror expensive and inefficient electric heating to highly-efficient gas CHP or renewables.
- Making use of existing low-cost 'waste' heat resources from nearby power stations, hospitals and London Underground stations.
- Access to lower carbon heating solutions, including renewables or higher efficiency heat generation through combined heat and power (CHP).

Tools to ensure district heating benefits are secured

Just as with poorly built roofs, badly ventilated buildings, or incorrectly installed boilers, district heating needs to be designed, installed and operated correctly if its benefits are to materialise.

There are three tools, which are now coming into place, which can help provide security and certainty for consumers that they will see the benefits of district heating schemes:

- New industry-wide heat network standards, also known as the Code of Practice;
- An independent heat customer protection scheme, called Heat Trust; and,
- New heat network metering and billing regulations.

Some of these initiatives are the result of over two years of collaboration between the district heating industry, the UK and Scottish governments, and consumer groups such as Which?.

1. District Heating Code of Practice

To ensure that heat networks are designed and operate effectively, the Association for Decentralised Energy and CIBSE have brought together industry partners to establish common standards for the development of district heating.

The Code of Practice for Heat Networks in the UK has been developed by a group of industry experts under a joint initiative by CIBSE and the ADE. The Code sets out standards to ensure the conception, design, build and operation of efficient, reliable and cost effective district heating for all users. The Code aims to establish minimum standards for new and retrofitted district and community heating networks schemes.

Recognising that district heating projects may need to adapt to varying local situations, the Code seeks to establish common standards for the development of reliable and efficient district heating whilst allowing for innovation. Roles and responsibilities of different stakeholders throughout the project are also specified.

Setting minimum (and best practice) standards should provide greater confidence for specifiers and developers, including local authorities and housing associations. These and other organisations can include these standards in the tendering/contracting process to specify minimum standards set out in the Code. Similarly, planning authorities could require new district heating developments to meet the design, installation and commissioning standards set out in the Code of Practice in their planning requirements.

The Code of Practice will be formally published early May 2015.

2. Heat Trust

The district heating industry has worked with consumer representatives since 2012 to develop the proposals for Heat Trust. The Association for Decentralised Energy announced in March that it was formally backing Heat Trust. The scheme is looking to launch later in 2015.

Heat Trust is aimed at heat energy suppliers who contract with metered or unmetered domestic and micro business properties where the heat customer pays their supplier directly for their heat energy. Although voluntary, the Scheme is supported by government, industry and consumer groups as an industry-led self-regulation initiative that recognises best practice.

Where appropriate, the level of protection afforded under the Scheme is comparable to that of gas and electricity customers. The proposals contain two key components:

- Assessment criteria by which to evaluate the level of protection a Heat Supplier's Heat Supply Agreement provides to the heat network's customers; and

- Independent adjudication, a low cost form of customer dispute resolution once heat supplier's complaint procedure is exhausted.

The Scheme has already attracted significant interest from heat suppliers, and expects to provide protection to over 20,000 heat customers in its first year.

As members of the Scheme, suppliers agree to abide by the Scheme Rules and Bye-Laws. The Scheme includes rules on the following:

- Support for vulnerable heat customers
- Heat supplier obligations
- Heat customer service and reporting a fault or emergency
- Joining and leaving procedures
- Heat meters
- Heat Interface Units
- Heat bill and heat charge calculations
- Heat bill payment arrangements and the management of arrears
- Suspension and resumptions of service processes
- Complaint handling and independent complaint handling
- Privacy policy and data protection

3. New Heat network metering regulations

Under new regulations put in place from December 2014, heat network metering and billing is now closely regulated through the National Measurement Office. These new regulations aim to:

- Give consumers control of the cost of heating and cooling;
- Set minimum requirements surrounding the transparent billing of consumers; and,
- Improve consistency and efficiency, alongside promoting the roll out and better management of heating and cooling networks.

There are a number of requirements in relation to the billing of consumers based on their consumption. These requirements include quarterly billing, optional electronic billing and access to consumption information and comparative data.

These new regulations will help to ensure that all heat customers on all new schemes across the UK will receive the quality of billing information they need.

Additional potential steps for Lewisham

The Association for Decentralised Energy recognises that while these three initiatives are important steps for improving consumer confidence in district heating, there are additional ways for Lewisham planning officials to further strengthen the quality of heating installations, including district heating as well as alternative solutions, in new developments. We have set out three recommendations below.

1. Ensure that any proposal is technology neutral.

There are a range of different possible heating solutions for a new building development, and all of them face a risk that performance in operation does not meet design. For example, DECC

analysis of both heat pumps[1] and biomass boilers[2] have found in-use performance has not met design expectations. We therefore recommend that any measures which Lewisham implements do not unfairly target one technology over any other.

For example, if Lewisham were to require district heating schemes to have their performance reviewed after commissioning, any such 'in use' review should be applied to all heating solutions in new development, as there is clear government evidence that this risk exists for a range of different heating solutions, and not just district heating schemes. The same principle should apply for any data collection requirements.

2. Expert review of design proposals

We would recommend that all new developments are required to provide detailed consultancy review of their proposed heating solutions, including expected efficiency and carbon savings. These reports could be used to help planning officials determine that the proposed solution is practical and appropriate for that development, taking into account the development's size, heat demand and demand profile.

In order to ensure such an assessment can be done well, the planning authority could also invest in specialist training or hire outside experts to review proposed heating solutions.

3. Set the Code of Practice as a minimum standard

Planning officials should require all developments which plan to use district heating ensure their schemes meet the standards of the Heat Network Code of Practice.

The Code sets out standards to ensure the conception, design, build and operation of efficient, cost effective district heating for all users. Planning approval could be contingent on schemes' ability to show they have met the minimum standards set out in the Code of Practice.

However, we would note that similar standards should be required for all proposed heating solutions for new developments, not just district heating.

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[1] DECC, 2012. ***Detailed analysis from the first phase of the Energy Saving Trust's heat pump field trial.***
[2] DECC, 2015. ***Desk-based review of performance and installation practices of biomass boilers for the Department of Energy and Climate Change.***