Home advantage

NATIONAL HOUSING FEDERATION

B3: Go on, go green

Speakers:

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NATIONAL HOUSING FEDERATION
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building services sustainability & environmental consultancy ltd

London Development Conference

Viable Communal Heating Systems

4th December 2012

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Introduction

b:ssec has been involved in the implementation of communal heating systems through:

- Energy strategies (incl. for planning).
- Due diligence support for clients.
- Post project reviews.

This presentation describes the following aspects of communal heating systems:

- Context – planning and policy drivers for communal heating.
- Design Approach – factors affecting viability.

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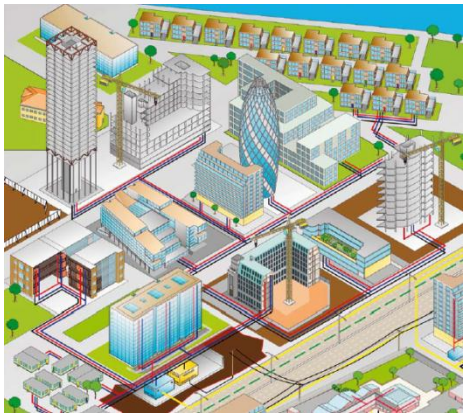
1. CONTEXT

Advantages of District Heating

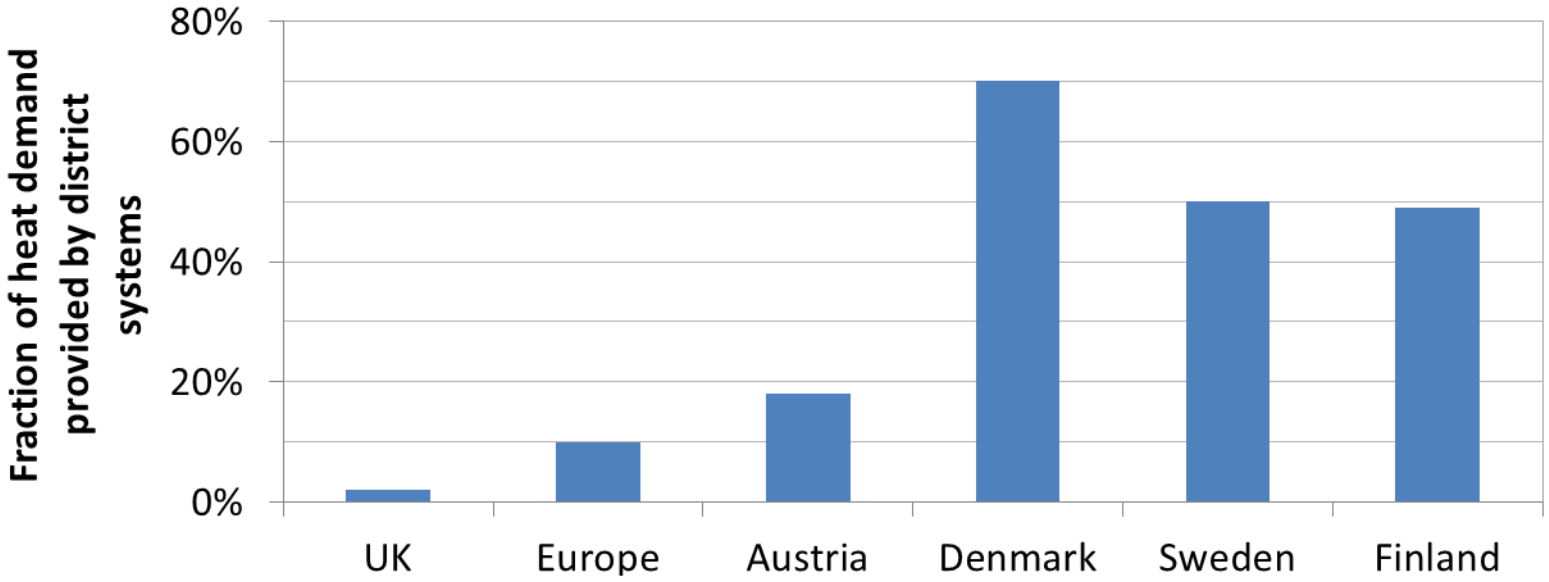
District and communal heating systems allow:

- The use of technologies which are typically not technically viable at the scale of individual homes (e.g. biomass or waste-to-energy).
- Economies of scale.
- Centralisation of fuel systems and maintenance.
- Easier adaptation to future technologies.
- Use of waste heat from industrial processes.
- Combination of heat users with matching patterns of demand.



National Policy

- The Government has a legal obligation to achieve an 80% carbon reduction by 2050 compared to 1990.
- The Government's current Carbon Plan projects 10% to 50% of England's heat demand met by district systems in 2050.
- The National Planning Policy Framework (NPPF) requires local councils to identify opportunities for decentralised low/zero carbon energy systems.



London Plan 2011 – Carbon

- Policy 5.2 has the following phased carbon requirements:

Year	Improvement on the Target Emission Rate of Part L 2010 of the Building Regulations
2010-2013	25%
2013-2016	40%
2016-2031	Zero carbon

- Major development proposals must have energy assessments set out according to the following hierarchy:
    1) Be Lean – Energy efficiency measures which improve on Building Regulations.
    2) Be Clean – use efficient decentralised energy such as combined heat and power (CHP).
    3) Be Green – use renewable energy (e.g. solar).

London Plan 2011 – District Energy

- Policy 5.6 requires that development proposals should evaluate the feasibility of combined heat and power (CHP) systems.
- It also requires major development proposals to select energy systems according to the following hierarchy:
    1) Connect to existing heating or cooling networks.
    2) Site wide CHP network.
    3) Communal heating and cooling

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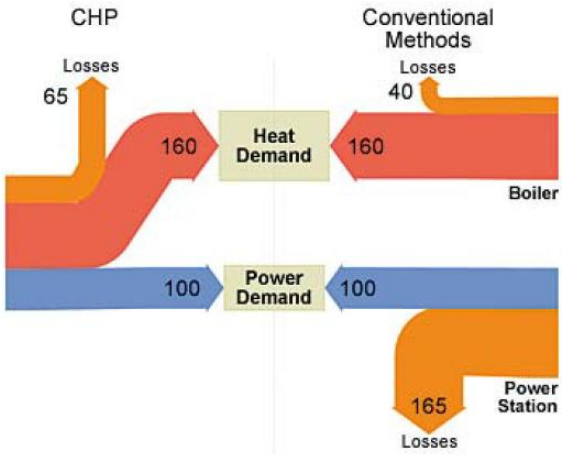
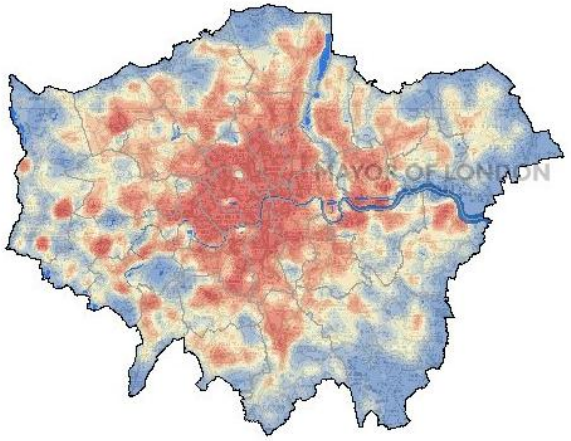


2. DESIGN APPROACH

Mapping

- To meet GLA requirements, two elements of heat mapping should occur:
  - Mapping of the neighbourhood.
  - Mapping of the development.
- Tools for neighbourhood mapping:
  - http://chp.decc.gov.uk/developmentmap/
  - http://www.londonheatmap.org.uk
  - Planning applications
  - Local authority contacts
  - Google Earth
  - On-the-ground surveying



Mapping the Neighbourhood

New 450 home housing association development with district heating

New 500 home residential development with district heating

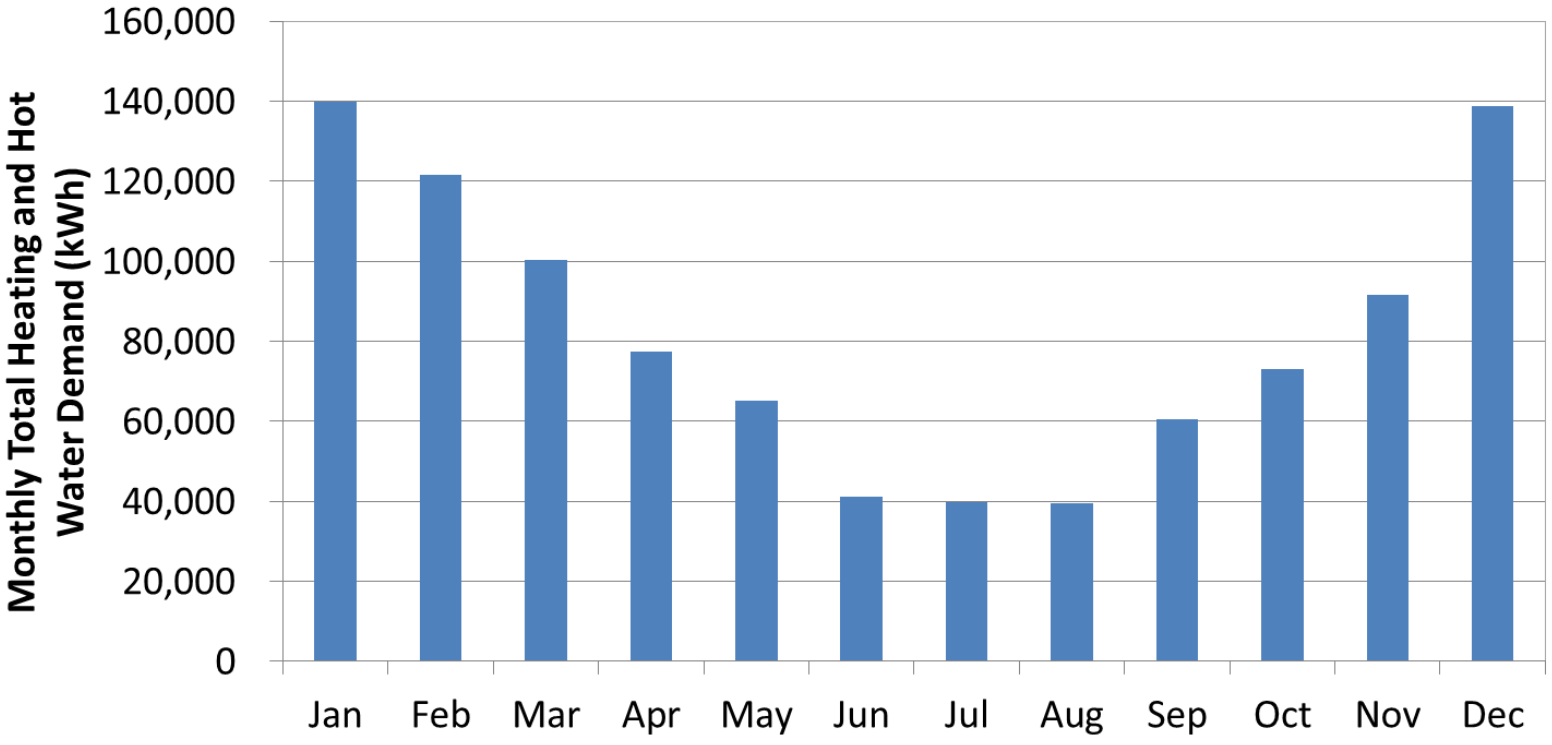
Town centre identified as a district heating opportunity area

500 m

Energy centre with CHP for hospital

Mapping the Development (1)

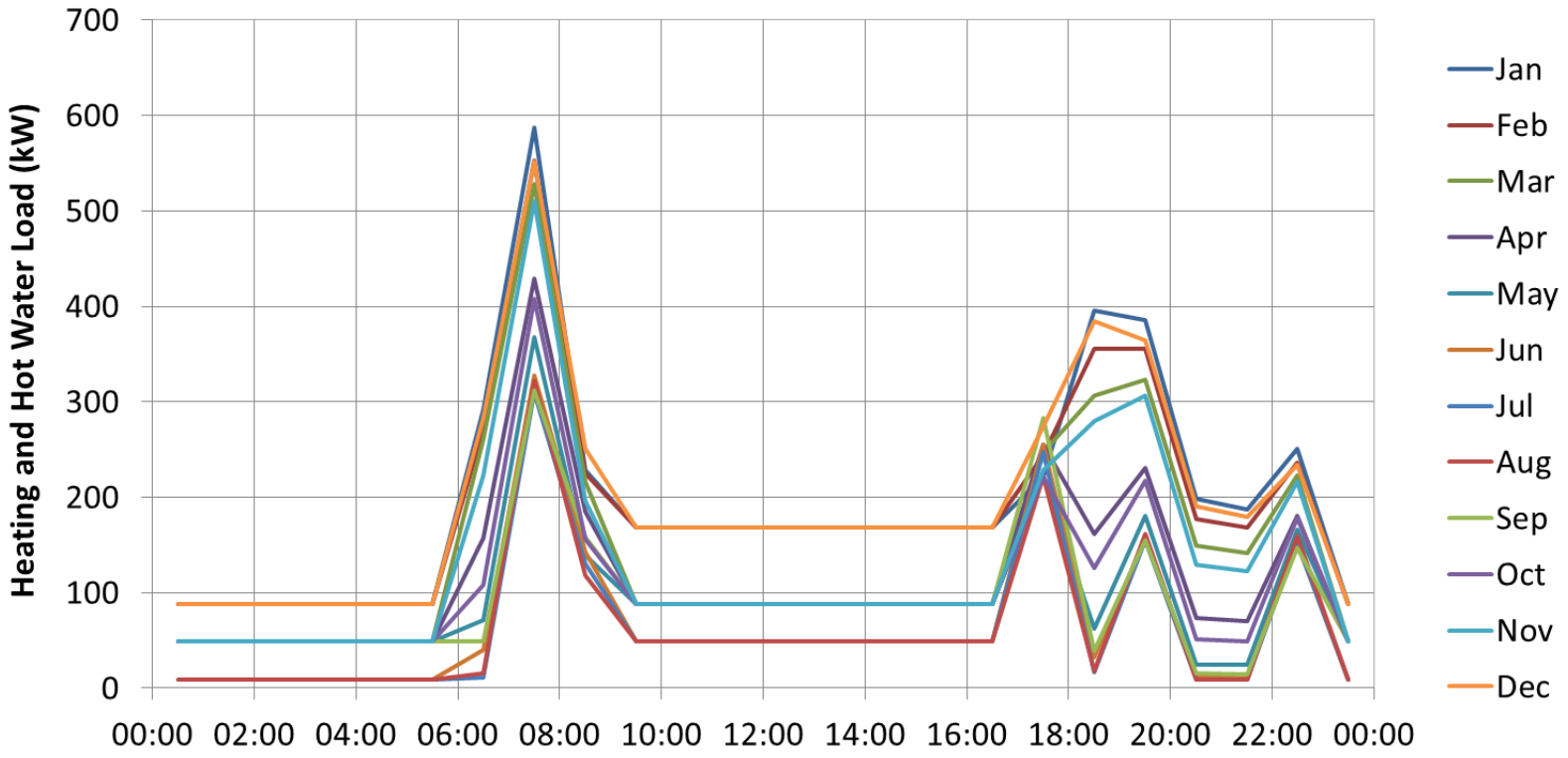
- Heat demand profiles should be predicted:
  - Over the year.
  - Over typical days.



- Care should be taken in the use of standard calculation tools such as SAP and SBEM.

Mapping the Development (2)

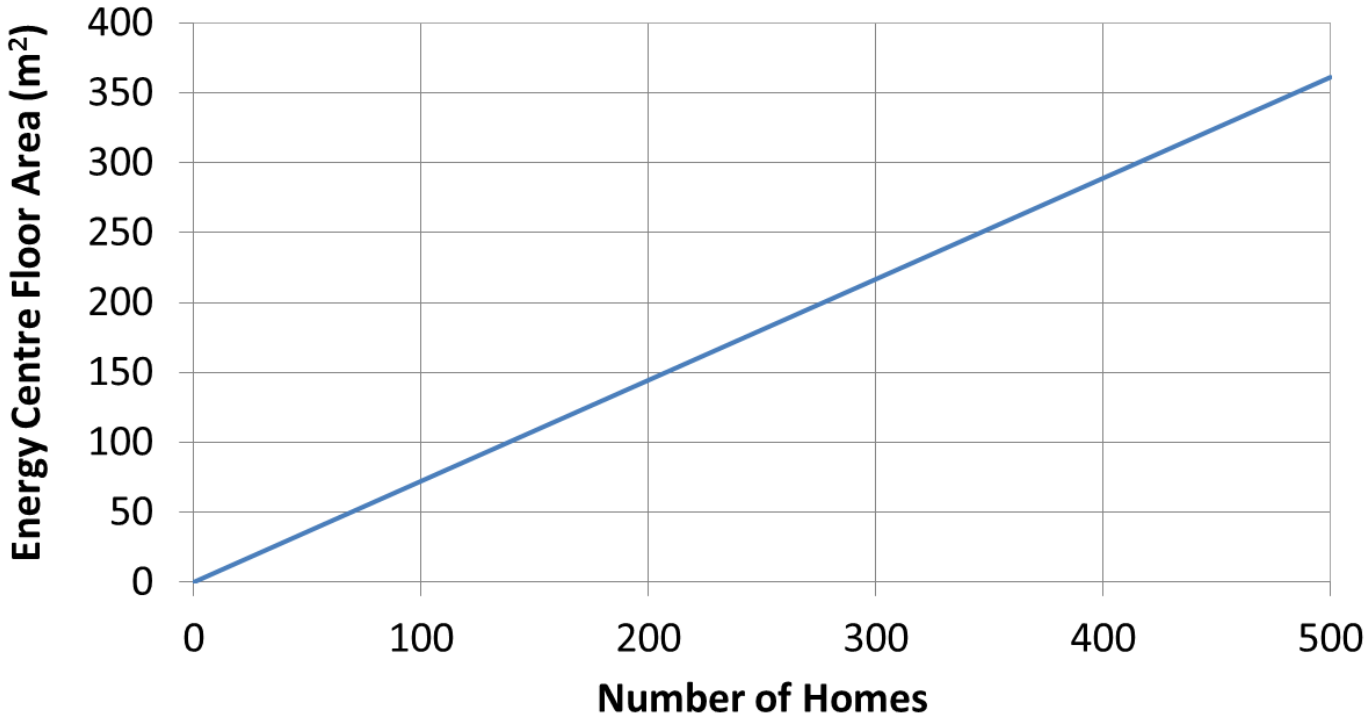
- Housing associations can help designers by providing operational gas data from other developments.



- Low carbon technologies benefit from constant demand.
- Demand can be smoothed out through central heat storage and local domestic hot water storage.

The Energy Centre

- Sufficient space should be provided for the energy centre early in the design process.



Size depends on technology type, heat storage and fuel type.

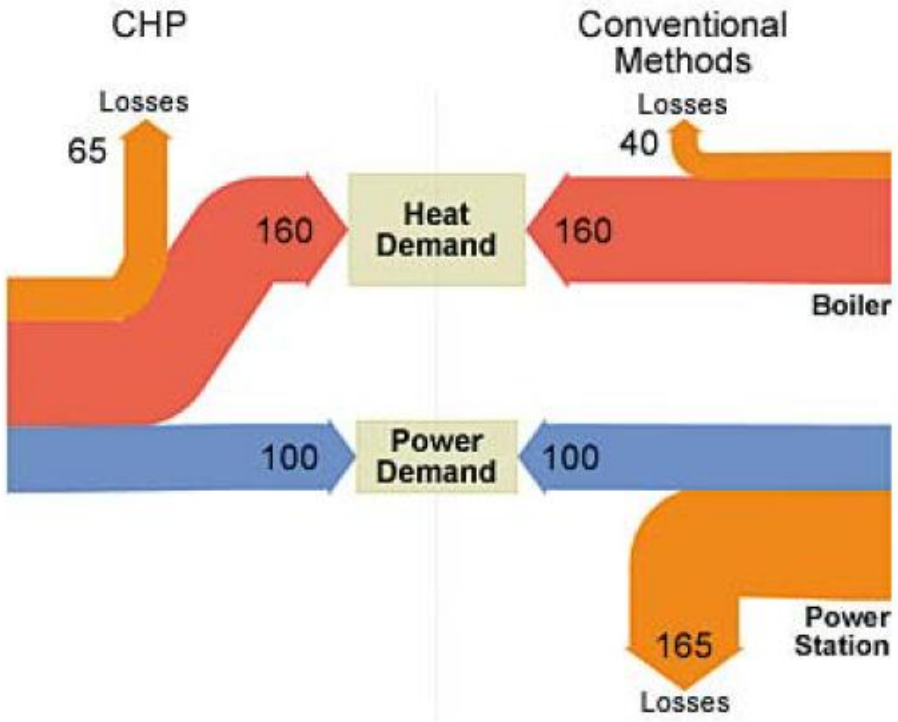
- Thought must be given to access arrangements for maintenance and fuel delivery.
- The flue position and height must also be considered.

Heat Distribution

- Pipework should have a minimum of a 30 year design life.
- Steel pipework is recommended for heat network mains, branches and consumer connections for new developments.
- The system should include automatic leak detection.
- Sizing, energy and cost calculations must take into account network heat losses.
- Heat network losses are affected by the layout of the network and pipe insulation.
- A new development with 60 homes per hectare would be expected to have 5-10% distribution heat losses.

Gas Combined Heat and Power (1)

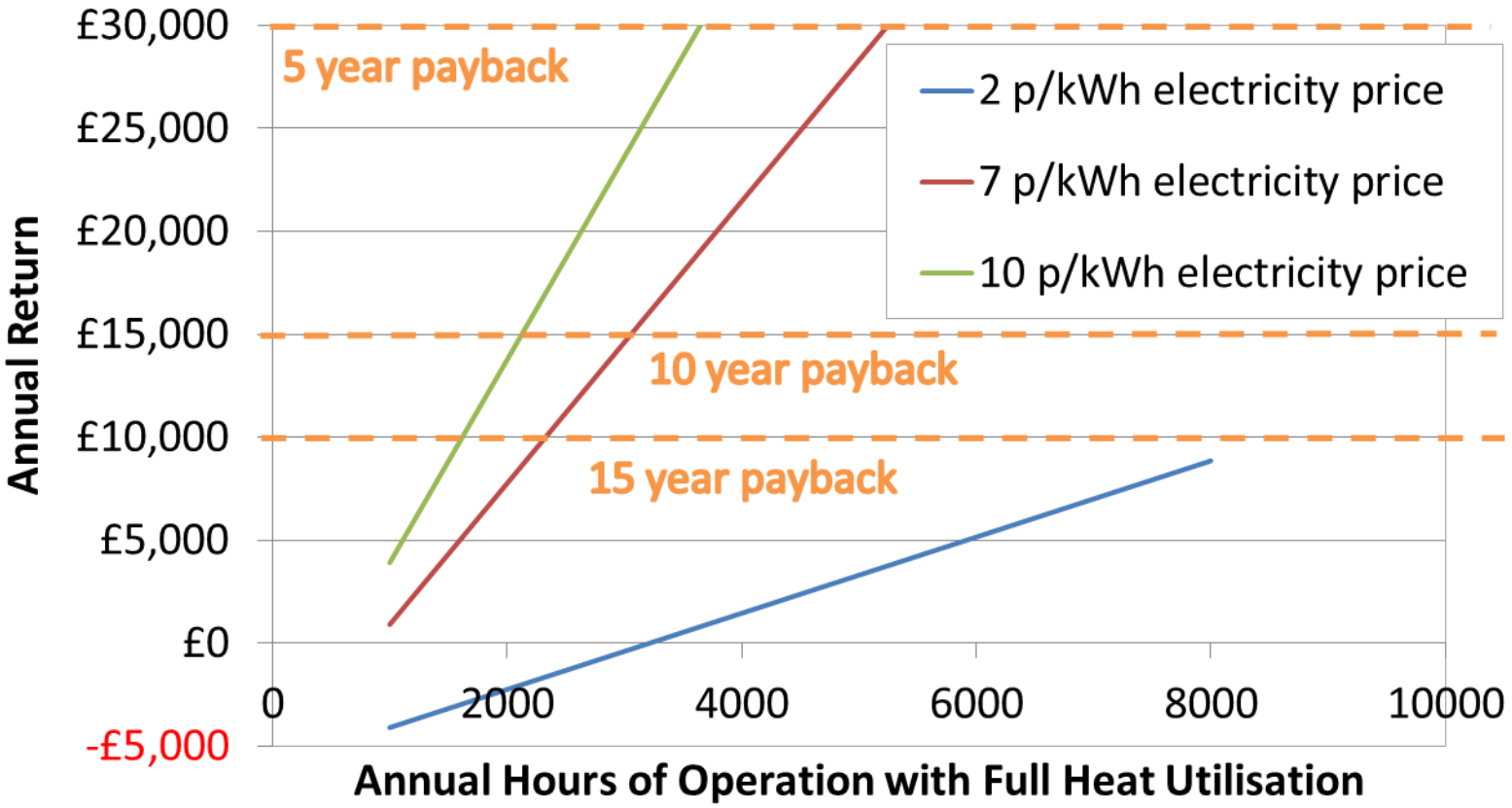
- Gas combined heat and power (CHP) achieves carbon savings by generating electricity and using the waste heat for space heating and hot water.
- It is the most widely implemented technology in district heating for new developments.



Gas Combined Heat and Power (2)

Economic operation of gas CHP depends on:

- The number of hours for which it can operate and have its waste heat fully used.
- The price at which electricity from the unit is sold.



Biomass Heating

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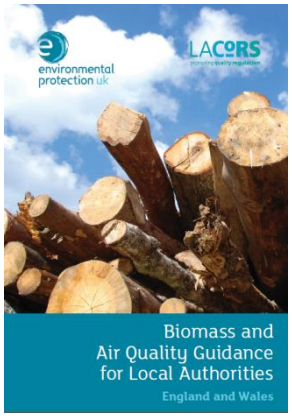
Advantages:

- Subsidised by the Renewable Heat Incentive.
- Achieves higher carbon savings than gas CHP.



Disadvantages:

- Maintenance requirements are greater than gas CHP.
- Many London boroughs object to the technology on the grounds of air quality and transport impacts.

Important Design Factors:

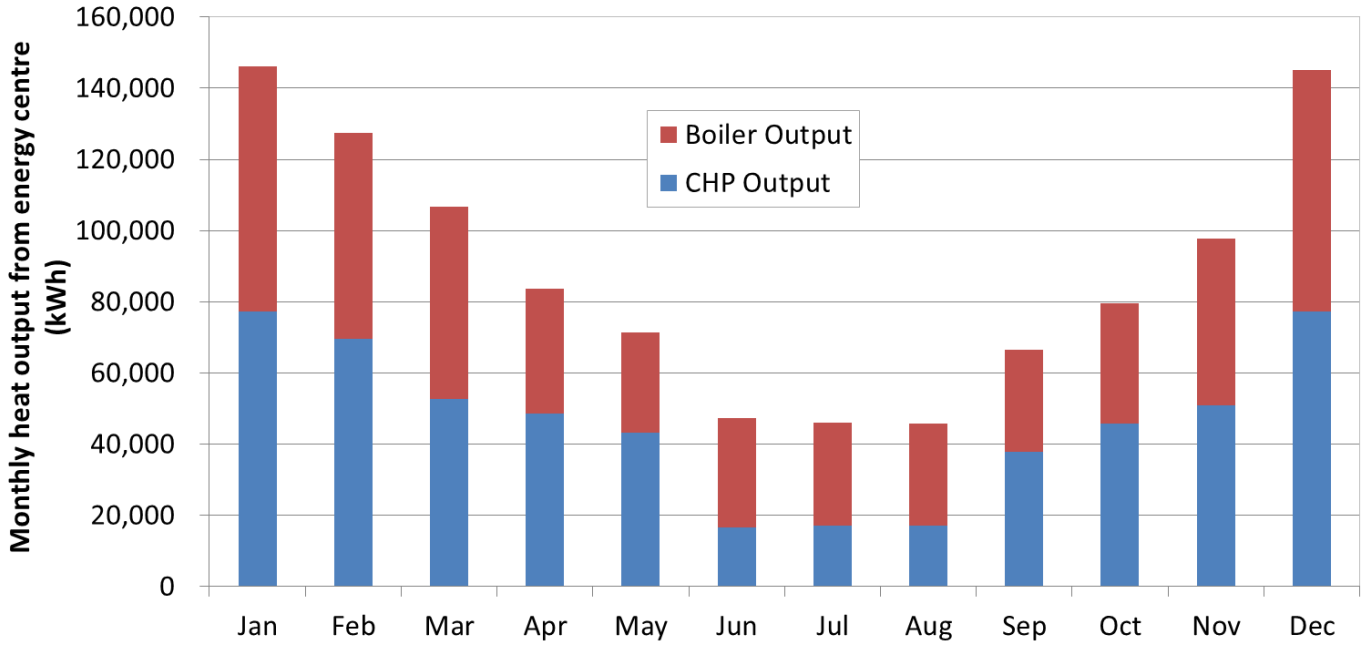
- Avoid over-sizing (like gas CHP).
- Ensure well-defined fuel standards.
- Fuel store design and sizing.

Other Technologies

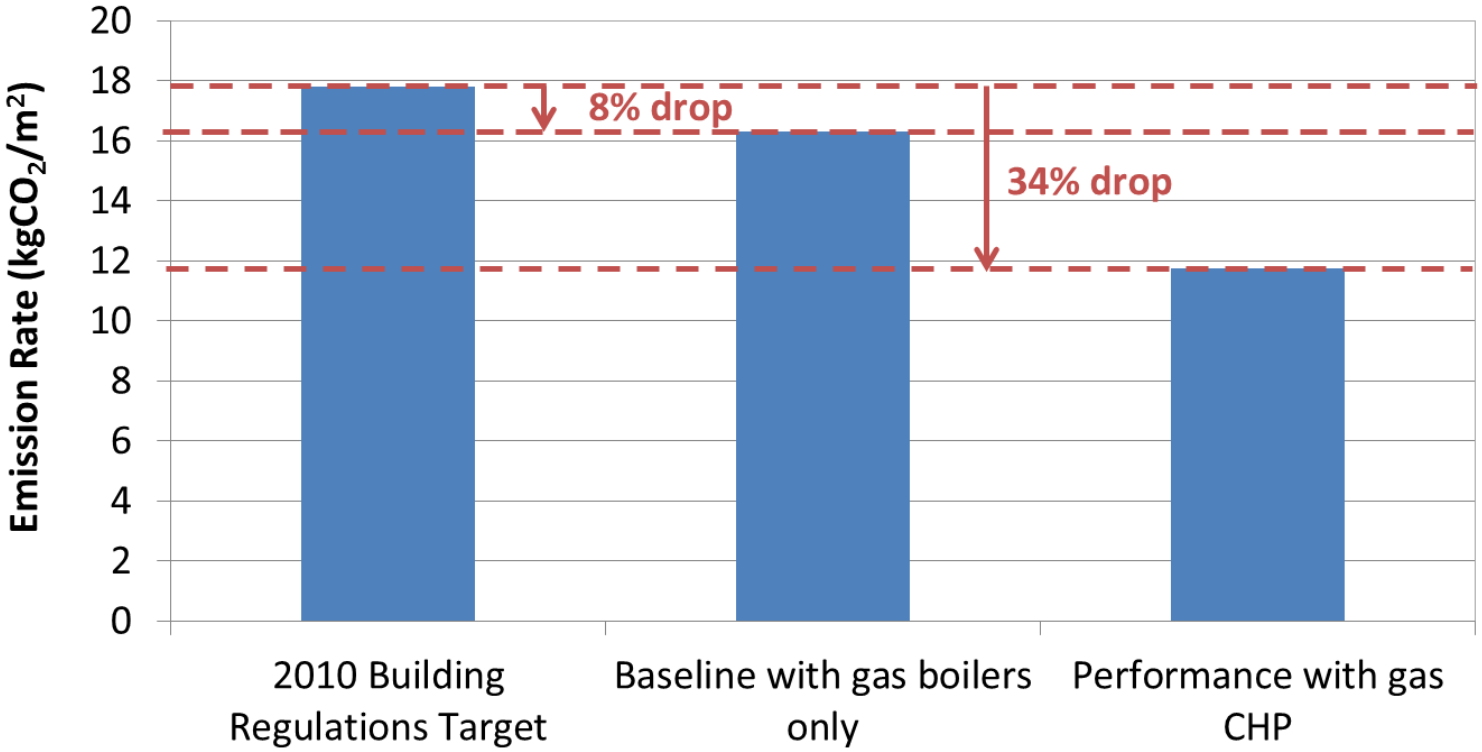
- **Biomass CHP** – widely implemented in Europe with some successfully operational units in the UK.
- **Fuel cells** – efficiently generate electricity using natural gas or hydrogen.
- **Industrial processes** – e.g. waste to energy plants are major potential sources of heat.
- **Heat pumps** – can be used centrally or in individual homes as part of an ambient heat loop.
- **Solar hot water** – has been used on a large scale in district systems in Europe.
- **Solar PV** – can be a cost-effective, flexible supplement to district energy systems.

Example – CHP Sizing

- 200 apartments.
- Apartment floor area = 76.5 m^2.
- Gas fired district heating.
- Load matching shows that a 70 kW_e / 110 kW_{th} gas CHP unit could provide 52% of space heating and domestic hot water, operating 5,000 hours per year.



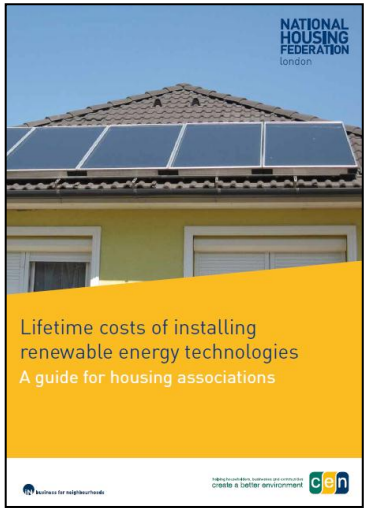
Example – Carbon Performance

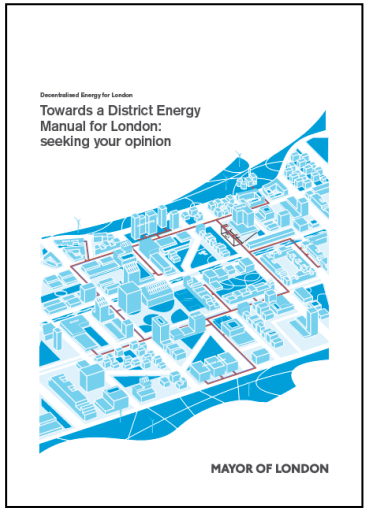


- Further carbon savings could be achieved through efficiency improvements (e.g. MVHR) or solar PV.
- An alternative lead heat source could be used (e.g. biomass).
- Supplementing gas CHP with solar hot water or biomass, or enlarging the CHP unit are not recommended.

Guidance

- National Housing Federation (2010) – Lifetime costs of installing renewable energy technologies.
- Mayor of London (in development) District Energy Manual for London.
- Carbon Trust (2010) Introducing combined heat and power





Thank You

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Communal Heating – The client experience

Robert Greene FCIOB MRICS
Head of Development

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Communal heating experience

- A2Dominion – Our Experience
- G15 - Communal Heating Research Project
- Questions

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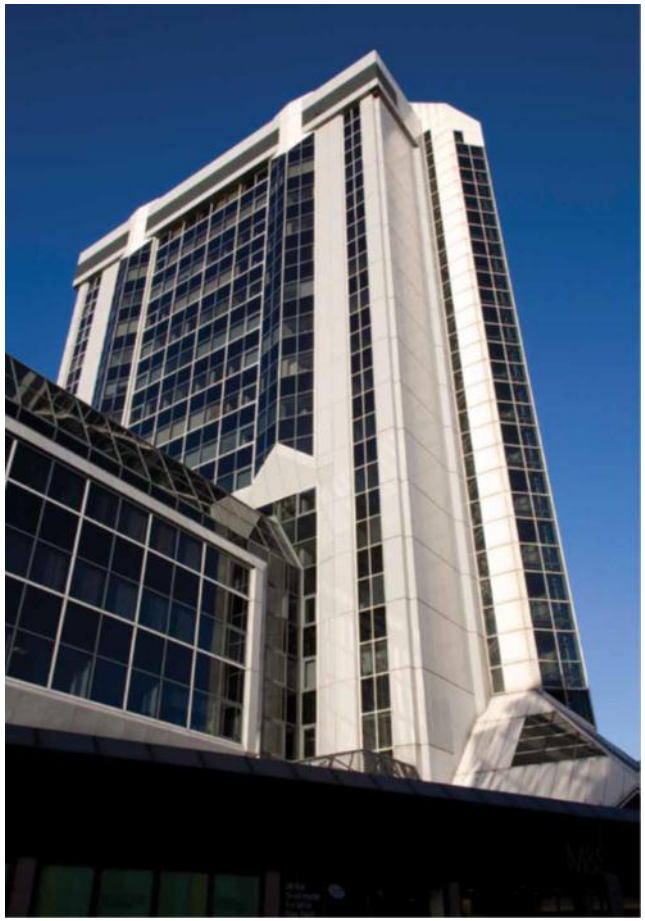
Communal heating experience

A2Dominion Group

- 34,000 homes
- London & S.E
- 900 Staff
- Member of G15



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Communal heating experience

- Almost 2000 homes with Communal Heating
- 6000 home development pipeline - 5 years
- 70% will use Communal heating systems

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Communal heating experience

Communal heating at Dominion Plaza (108 units)

- A2D as developer
- D&B Contractor
- Energy specification?
- Expert design support?
- Quality assurance?
- Commissioning?
- Energy Provider?

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Communal heating experience

- Best Gas tariff?
- Right documents?
- Metering?
- Billing System?

Gas boiler

Communal heating experience

A2Dominion has…….

- Appointed Energy Consultant
- A2D Energy Specification with ER's
- Sustainability (Pre-contract) Sign-off
- Joined-up client teams and 360° feedback
- Invested in Quality Assurance Team

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Communal heating experience

And……..

- Legal heat agreement
- Tenancy and Leases agreements amended
- Energy procurement (better tariff deals)
- Appointed energy contractor
- Installing ‘Smart’ Prepayment metering
- Energy provider?

Communal heating experience

G15 and the Communal Heating Research

- G15 - London largest Housing Associations
- Over 420,000 homes in London
- 134 Schemes with Communal (Decentralised) heating
- Approx. 11,000 units completed/on-site

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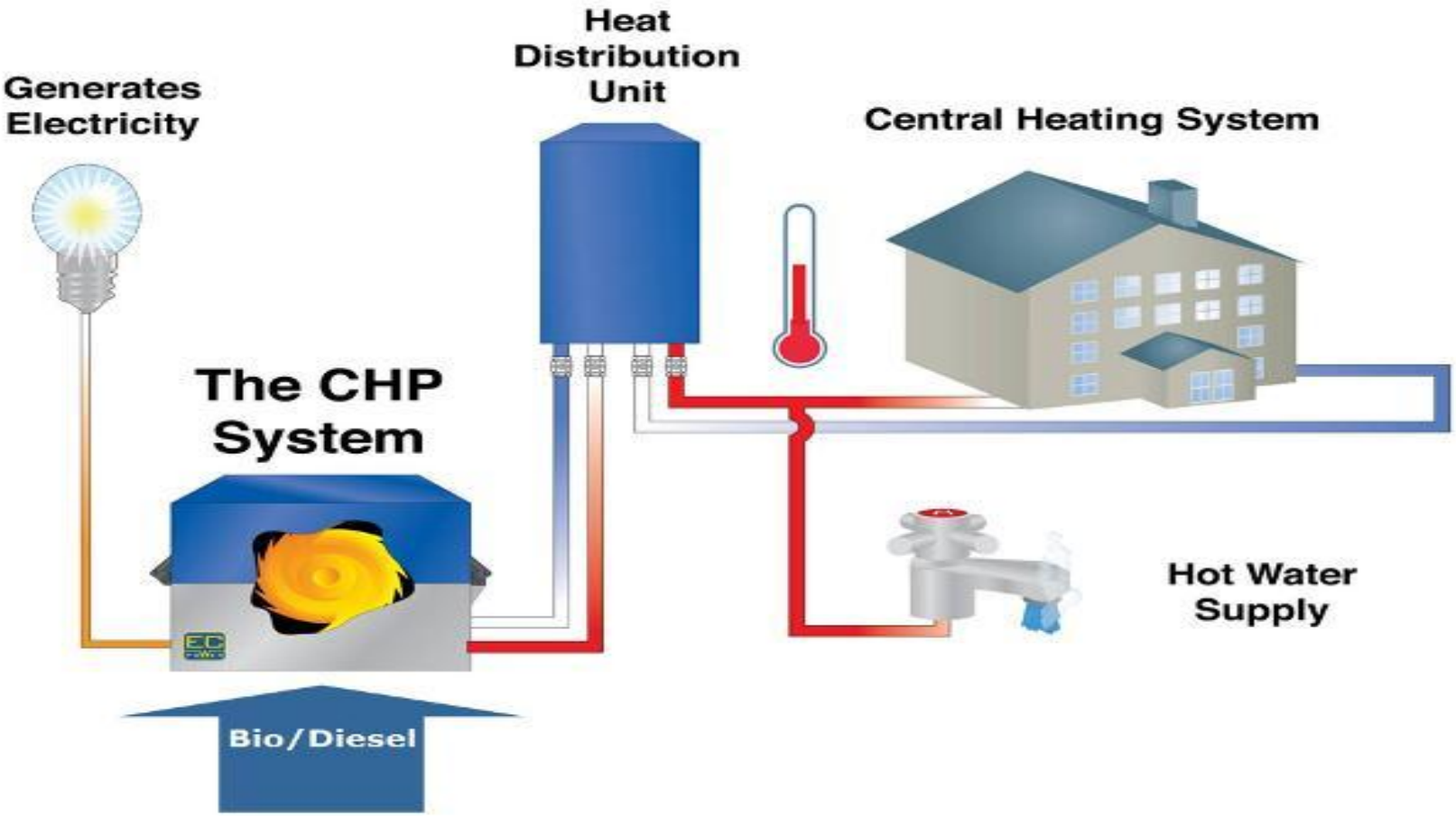
Communal heating experience



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Communal heating experience

G15 working together

- Gathering facts
- Sharing experience
- Case studies
- Researcher
- Analyse
- Publish findings

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G15 Communal heating experience

Research Case Studies – 8

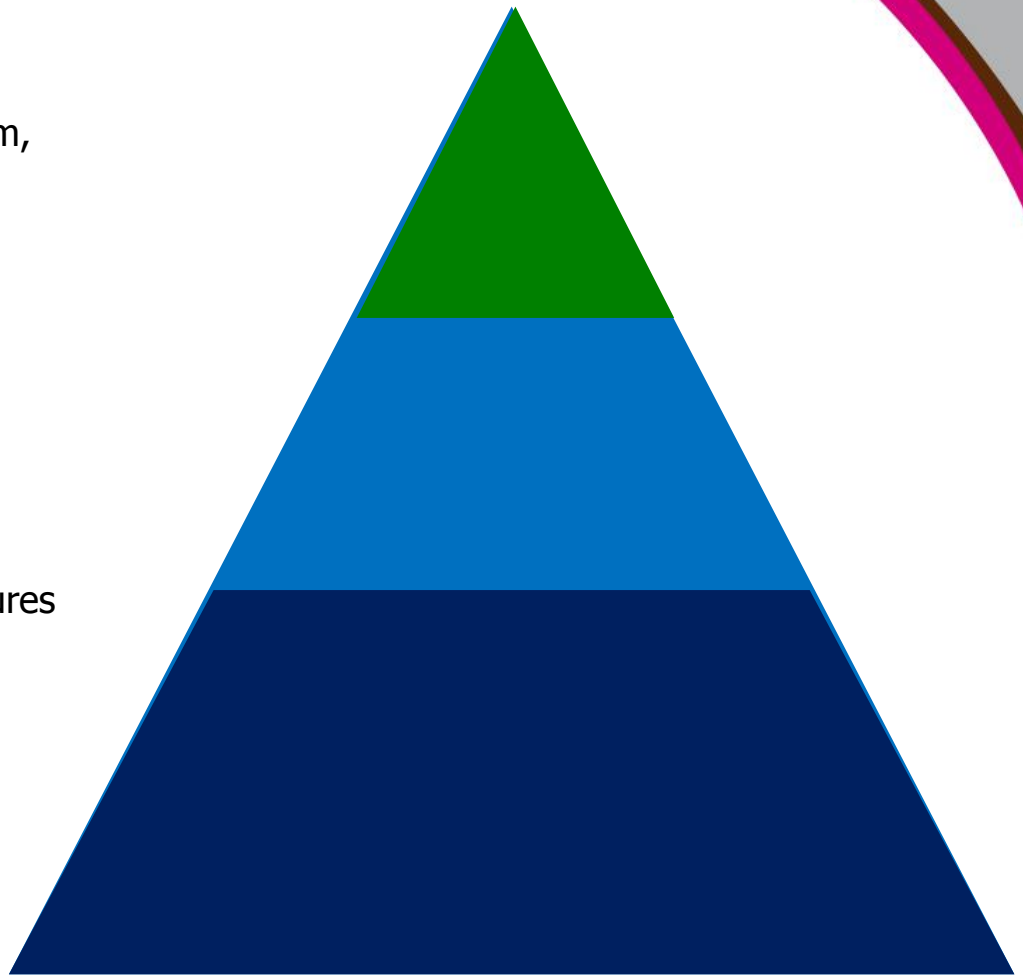
- Interviews with development project team, maintenance staff and housing team
- Design information
- As built Mechanical and Electrical details
- In use consumption and tariff data
- Lifecycle costing

Generic Case Studies – 40

- Scheme information
- Additional information on successes/ failures

G15 installations - 300

- Basic scheme information - numbers



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G15 Communal heating experience (2008-11 Programme)

57 Schemes

- 11 CHP Engines
- 19% of programme

CHP Engine

G15 Communal heating experience (2008-11 Programme)

57 Schemes

- 28 Biomass boilers
- 49% of schemes

Biomass Boiler

G15 Communal heating experience (2008-2011)

- From 20 units

- To over 400 units

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G15 Communal heating experience (2008-2011)

24 topics areas identified by the group:

Technical	Business and administration
○ Design ○ Installation ○ Phasing ○ Commissioning ○ Operation ○ Service failure ○ Maintenance ○ Compliance ○ Data/ efficiency ○ Collection and meters	○ Forecasting ○ Business modelling ○ Tariff setting ○ Legal framework ○ Metering ○ Billing ○ Debt management ○ Contract drafting and management ○ Service charges ○ Management information ○ Procurement of energy ○ Resident management ○ Overheating ○ Fuel poverty

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G15 Communal heating experience

	A2Dominion	Affinity Sutton	AmicusHorizon	Catalyst	Circle	East Thames	Family Mosaic	Genesis	Hyde	L&Q	Metropolitan	Network	Notting Hill	Peabody	Southern	Priority score
	K	L	M	N	O	A	B	C	D	E	F	G	H	I	J	
Design	H	H	H		H			H			H		H		H	24
Installation	L	M	H		L			H			L		H		M	16
Phasing	M	M	M		M			L			L		M		L	13
Commissioning	H	H	H		M			H			M		H		H	22
Operation	M	H	H		H			H			M		H		L	20
Service failure	M	M	M		M			M			M		M		M	16
Maintenance	H	H	H		H			H			H		H		M	23
Compliance	L	M	L		L			L			L		L		L	9
Data/ efficiency	M	M	M		M			H			M		M		M	17
Collection/ meters	H	M	H		H			M			H		M		H	21
Forecasting	L	M	L		L			L			L		L		L	9
Business modelling	L	L	L		L			M			L		L		L	9
Tariff setting	H	H	H		H			H			H		H		M	23
Legal framework	L	M	M		L			L			L		H		M	13
Metering	H	H	H		H			H			H		M		H	23
Billing	H	H	H		H			H			H		H		M	23
Debt management	M	H	M		H			H			H		H		H	22
Contract management/ drafting	M	H	H		M			L			H		M		M	18
Service charges	H	H	H		M			L			H		M		M	19
Management information	L	M	L		L			L			L		L		L	9
Procurement of energy	L	H	L		L			M			L		M		L	12
Resident management	H	H	H		H			H			H		M		L	21
Overheating	M	L	M		H			M			H		H		L	17
Fuel poverty	H	H	H		H			H			M		M		L	20

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G15 Communal heating experience

Agreed focus for researchers

- Design – Specification and strategy
- Metering and billing
- Commissioning and maintenance

Communal heating experience

What's next…..

- Appoint Researcher/Consultant
- Gather/Analyse Information (Jan/Feb)
- Draft Report (March)
- Publish Findings (April/May)

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Communal heating experience

Thank you

Questions

Home advantage

NATIONAL HOUSING FEDERATION

Your feedback is important to us!

Thank you for attending and please don't forget to complete your evaluation form and hand it to a member of Federation staff before you leave.