

Combined Heat and Power Association

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Practical Implementation of District Heating Projects

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Deputy Director



chpa

Bringing Energy
Together



1. Local councillor 15 years
2. Chair planning committee 4 yrs
3. Parliamentary researcher
4. Manager EST energy advice centre
5. **SPD on Sustainable Energy: Lewes DC**
6. Worked on Planning and Energy Act 08

Taking UK officials to see energy from waste plant in Copenhagen 2008

Kingston signs the FoE Climate Change Resolution 1995



With Govt officials, Woking Fuel Cell 2005



Presentation to MPs & Peers HoP 2004



Combined Heat and Power Association (CHPA)

- Originally the District Heating Assoc
- 100 members inc large utilities, manufacturers, developers and LA's
- Success in lobbying Government (CCL exemption, ECAs, Zero-Carbon Buildings, FiT)
- Setting up standards for DH industry



French election may halt nuclear option

Industry analysts believe new administration of anti-nuclear Socialist François Hollande could force EDF to scrap its UK nuclear plans

UK nuclear plans hit by costs

- Energy policy hanging by thread after only credible company left to build nuclear reactors raises price by 40 per cent to £7 billion each



British Gas owner Centrica has warned that 15.9 million households faced higher gas and electricity bills
11 May 2012

District Heating - past... ...and present



District Heating

- old block heating



377,000 dwellings in England on “district heating systems” - 1.8% dwellings

(around same numbers dwellings as electric heating)

Source CLG: 2001 English House Condition Survey

DECC

Digest of United Kingdom Energy Statistics 2011



Table 6C: Number and capacity of CHP schemes installed in buildings by sector in 2010

	Number of schemes	Electrical capacity (MWe)	Heat capacity (MWth)
Leisure	394	50.8	51.2
Hotels	244	34.7	39.9
Health	184	134.3	159.7
Residential Group Heating	35	26.6	59.1
Universities	42	53.7	65.2
Offices	18	14.8	11.4
Education	19	10.3	17.7
Government Estate	15	15.2	17.5
Retail	118	27.2	3.4
Other (1)	3	10.5	18.7
Total	1,072	378.1	443.7

(1) All schemes under Other are at airports

“Campus Power”

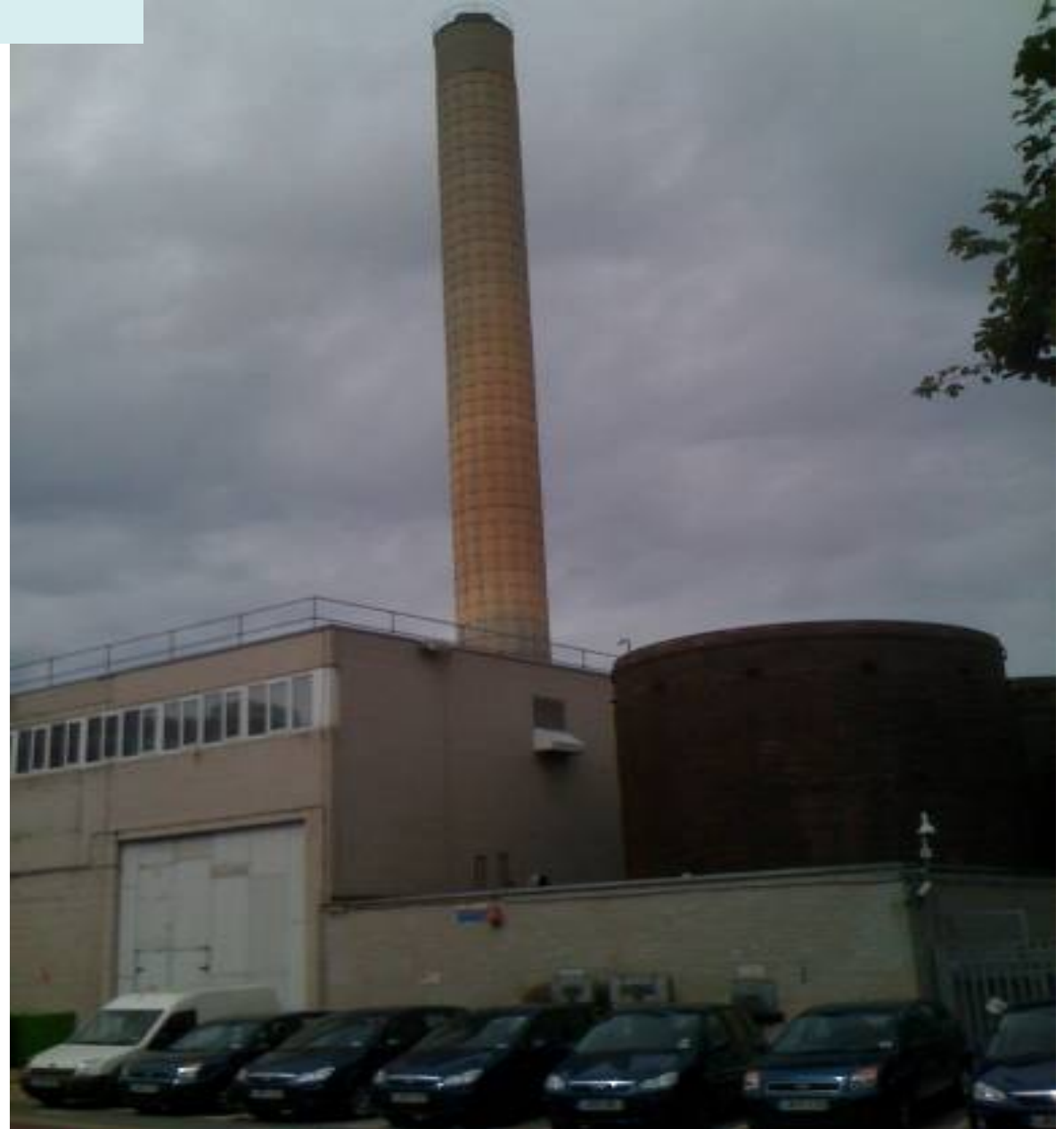
*Pic: Energy Centre
St George's, Tooting*

100 hospital sites
have CHP with
district heating &
cooling

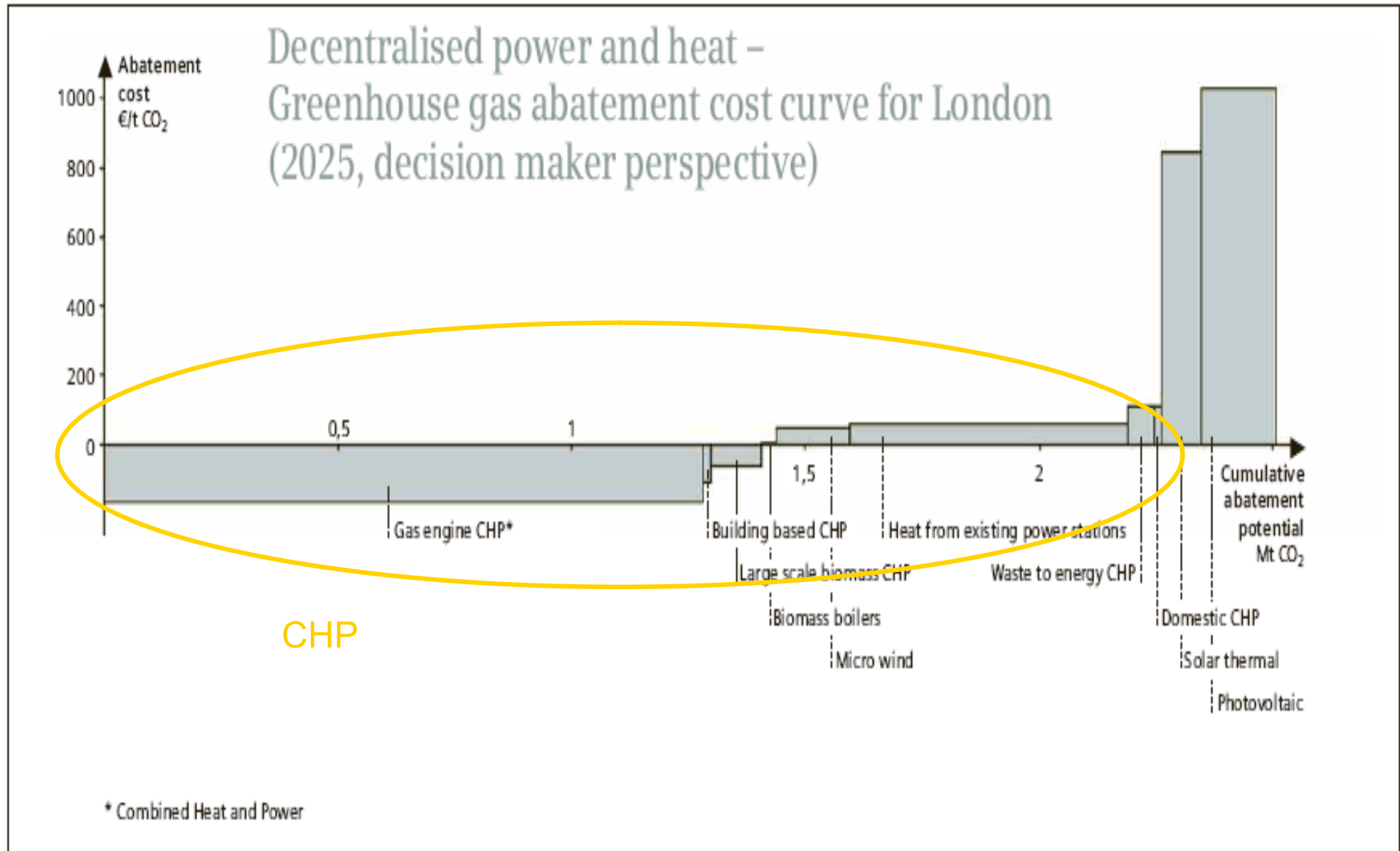
Out of 250 large sites

42 universities have
CHP (*DUKES 2009*)

Out of 300
universities and
colleges



CHP & DH: Least Cost



Source: McKinsey & Company, 2008

Poyry Report

for
DECC
April
09

Now - DH 2% heat supply
500,000 dwellings
14% technically possible

10% discount rate
Replace electric heating:
70,000 dwellings + some commercial
= 0.3% heat demand

3.5% discount rate
All social housing:
1,400,000 dwellings + more commercial
= 2% heat demand

6% discount rate
20% reduction capex:
1,600,000 dwellings + more commercial
= 3.1% heat demand

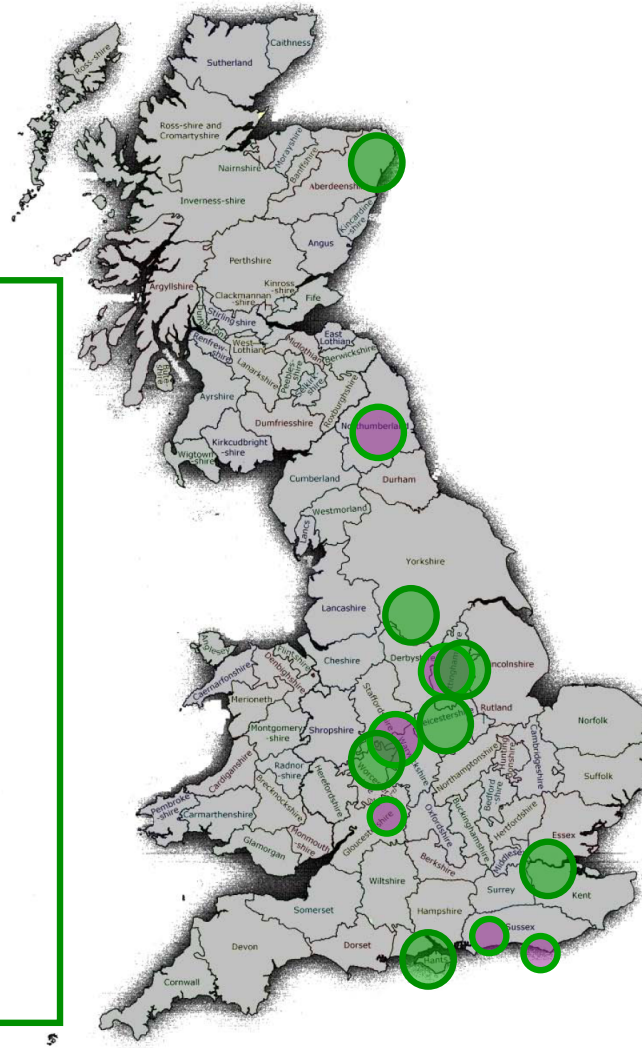
HCA's Low Carbon Infrastructure Fund (LCIF) 2009 £21M

- Cranbrook New Community, East Devon County Council
- Greenwich Peninsula, London Borough of Greenwich
- Cranston Estate, London Borough of Hackney
- Manton and Reynolds Towers, Birmingham City Council
- Milton Keynes, Milton Keynes Council
- Riverside Dene, Newcastle City Council
- The Hub and Southside, Nottingham City Council
- Wood End, Henley Green and Manor Farm (WEHM), Coventry City Council
- Mayflower Gantry, Southampton City Council
- Woolston Riverside, Southampton City Council
- Yarn Street, Aire Valley, Leeds City Council
- Cambridge and Crescent Towers, Birmingham City Council
- Hanham Hall, South Gloucestershire District Council

Over 50 large “city” schemes existing, under consideration or evaluation*

Established or Expanding

- Aberdeen
- Birmingham
- Leicester
- Several in London
- Nottingham
- Sheffield
- Southampton
- Milton Keynes



Under Development or Evaluation

- Edinburgh
- High Wycombe
- Leeds
- Manchester
- Newcastle
- Oxford
- Stoke-on-Trent

*AEAT

positive shift in attitude of UK Government to DH

1. new Directorate for Heat and Industry
2. Government's response (Carbon Plan) to the Climate Change Committee's 4th Carbon Budget report in the autumn
3. DECC heat strategy
4. National Infrastructure Plan
5. Green Investment Bank/UKGI



Carbon Plan (2023 to 2027)

- **“up to half” heat demand** in areas dense enough to make heat networks viable.
- **initially fuelled by gas CHP**, but eventually more energy from waste, large heat pumps or waste heat from nuclear or CCS plant.
- **cost-effectiveness** key advantages **over installing large numbers of small heat pumps**
- **most efficient deployment of other low carbon or renewable heating technologies**, such as biomass boilers.
- **barriers** to delivering district heating include planning and consent [is this true?], identifying and matching demand for heat with supply, and raising capital
- **DECC will set out in 2012 how will work with local authorities and other stakeholders to address barriers.**

National Infrastructure Plan

- published by the Treasury alongside Autumn Statement 29 November
- new focus on heat networks to decarbonise UK's energy system
- Repeat of Government commitment to work with Local Authorities and other stakeholders to address barriers, including the cost of installing the pipes, as well as regulation, ownership and charging structures.

CHPA paper to Barker (November 2011)

- Serious gaps in present Govt policy re decarbonising buildings eg FiT, Green Deal/ECO and Z-C
- District heating could fill those gaps
- large scale needs finance at utility interest rates.
- GIB, followed by “Allowable Solutions” could reduce overall cost of money

• Allowable Solutions could help de-risk DHC schemes by providing a 25% capital contribution



Paper to Barker (cont)

- Concentrate on **urban centres**
- **8 million dwellings** connected at reasonable cost*
- **major share of commercial and public buildings***
- **carbon emissions from heating halved to 9.13 million tonnes** per annum, if CHP and waste heat used (with potential to go further with renewables).
- Substantial projects will lead to significant levels of re-employment in the building trade during the roll-out period.
- Economic benefits realised locally in each participating city, through an increase in jobs and reduced energy prices.
- 42,000 jobs will be required each year of the construction programme.

**The potential and costs of district heating networks (Pöyry/AECOM & DECC 2009)*
Other information provided by CHPA members

Planning & Energy Act 2008

Planning Requirement for site



Unknown
number going in
– **70 CHP units**
installed in
residential by
CHPA members
in **2010**

Padd55 Award winning residential development
(Daily Mail UK Property Awards 2008)

Light touch electricity supply licensing system

- initiative being taken both by London and DECC with 6 London boroughs
- junior electricity supply licensing system for decentralised energy providers



UKGI and Green Investment Bank

- UK Government will invest as UK Green Investments (UKGI) in green infrastructure projects from April 2012, ahead of obtaining state aid approval for the Green Investment Bank.
- UKGI will make available up to £100 million in next financial year for commercial and industrial energy efficiency projects.
- Representatives have made clear to CHPA that “pipeline” of DH work is wanted and **standardisation of contracts**

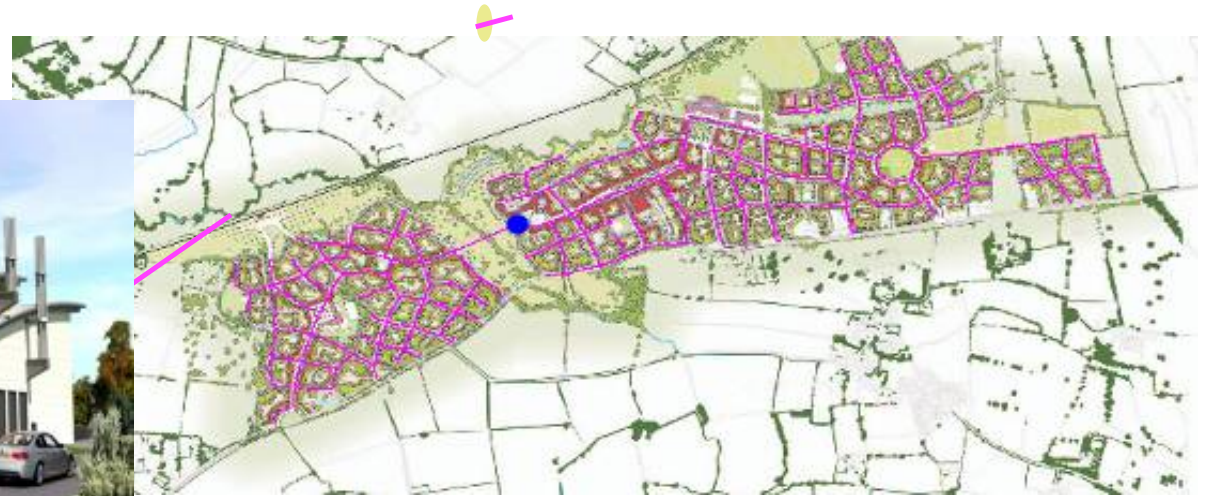
Examples

HCA funding: £25 million plus

Cranbrook and Skypark Energy Solution



Image courtesy of eon



District heating

Homes and commercial buildings connected by 75 km of heat pipes

Energy Centre

- 1.4 MWe natural gas CHP units and five 4 MWth Natural Gas boilers
- Two advanced thermal gasification units linked to two 1.4 MWe CHP engines
- Thermal stores
- Output Capacity when fully operational 4.2 MW electricity and 25.4 MW heat
- c 13,000 t /year CO₂ savings per year

Aberdeen Heat & Power



- The work awarded by landlord, Aberdeen City Council (ACC), to Aberdeen Heat & Power
- AH&P a community owned not-for-profit company set up specifically for project.
- work with the Stockethill estate of 288 flats, in 4 multi-storey blocks.
- electric storage heating, installed in 1970's.
- average National Home Energy Rating (NHER) of the flats was 3.3 (poor)
- 70% of the residents in fuel poverty.
- Tenure was 98% council tenants and 2% private leaseholders.
- Total capital cost was £1,530,000, with the Community Energy Programme providing £730,000 grant for capital costs.
- Total Lifetime cost was £1,896,956, with bank financing of up to £1 million based on income from the Council of £215,000 per annum, and some Energy Efficiency Commitment (EEC) monies to offset costs of heating systems within leaseholder flats.
- Any surplus generated by independent company provides capital to start work on the next cluster.
- The district heating-CHP in Stockethill was switched on in December 2003. AH&P originally charged ACC £4.25 per flat per week for the heating.

Aberdeen Case Study

Table: Aberdeen Heat and Power options for improving Stockethill

The option 6 was chosen as the best cost/benefit

Option	Over-cladding	Cost/Flat	Heat cost/Flat
1. Electric	£4.3M	£20,000	£14.27
2. Central Blr	£5.4M	£23,000	£5.65
3. CHP Plant	£5.6M	£24,000	£3.18
Option	No Over-clad	Cost/Flat	Heat cost/Flat
4. Elect Htg	£0.4M	£1,691	£15.73
5. Central Blr	£1.0M	£4,464	£5.83
<u>6. CHP Plant*</u>	<u>£1.2M</u>	<u>£5,000</u>	<u>£3.65</u>

Projected to improve the NHER to 6.0, reduce tenant heat costs by 40% and reduce CO2 emissions by 42%.

Source: Aberdeen Heat and Power Co.

- After Stockethill the company moved on to Hazlehead where 4 blocks with 180 flats were completed with links to a school and swimming pool and a sports facility.
- Further development at Seaton adds 500 flats and links to a regional sports facility and beachfront complex.
- There are now 1000 households connected which represents 27% of City's housing stock.
- This accelerated programme of refurbishment has been achieved in 5 years.

Sheffield



Sheffield

- largest UK district heating scheme
- established 1988
- heat and electricity from Sheffield Incinerator - 225,000 tonnes of waste produces 60MW thermal energy 19MW electrical energy.
- 44km of underground pipes delivering heat to 140 offices, public buildings, hotels and leisure facilities, and 2,800 dwellings.
- prevents average 21,000 tonnes of CO₂ from being released, and also lowers NOX

- **Sheffield council “encourages” connection through the planning system.** All significant developments (new or conversions of five or more dwellings – including apartments – or more than 500m² gross internal floor space) required to provide a minimum of 10% of their predicted energy needs from decentralised and renewable or low carbon energy, and to reduce the developments overall predicted carbon dioxide emissions by 20%.
- **Local environmental NGOs oppose the scheme because of the incinerator.** In 2001 Greenpeace staged a protest against the incinerator, declaring it the worst incinerator in England. However, in 2006 a new incinerator was commissioned to meet the Waste Incineration Directive.
- **Sheffield sends only 15% of waste to landfill (the second lowest level in the UK).**
- Sheffield University is involved in the scheme and is strongly supportive, through the Sheffield University Waste Incineration Centre.



Pimlico



Woking Borough



Starting 1991 in own buildings:

- **ENERGY CONSUMPTION SAVINGS (2006) 52%**
- **CO2 REDUCTIONS (2006) 82%**
- **CHP (2005) 82%**
- **RENEWABLE ENERGY SELF GENERATION (2005) 11%**

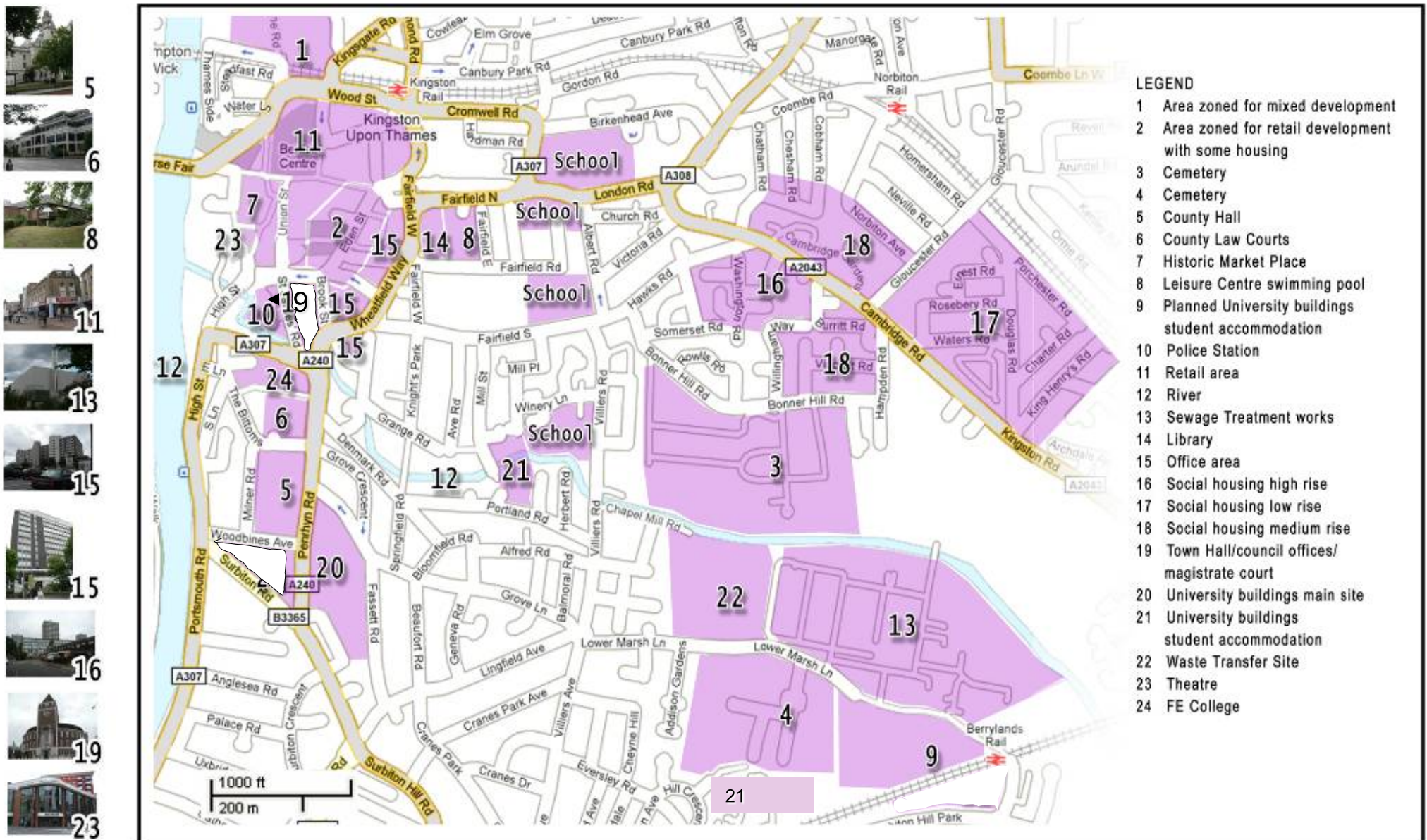
Citigen – E.on



Citigen CHP / DHC system

1. owned and managed by E.on
2. heat, electricity and chilled water
3. 11 buildings including Guildhall, the Barbican Arts Centre, the Museum of London and London Central Markets (Smithfield) as well as other
4. major commercial customers through a 1.6 km distribution network.
5. Commenced operation in 1993
6. one of only two large community energy systems in the UK which distribute both heating and chilled water.
7. current capacity of 30MWe with planning consent for 90MWe

Anytown town centre – large heat loads



- LEGEND**
- 1 Area zoned for mixed development
 - 2 Area zoned for retail development with some housing
 - 3 Cemetery
 - 4 Cemetery
 - 5 County Hall
 - 6 County Law Courts
 - 7 Historic Market Place
 - 8 Leisure Centre swimming pool
 - 9 Planned University buildings student accommodation
 - 10 Police Station
 - 11 Retail area
 - 12 River
 - 13 Sewage Treatment works
 - 14 Library
 - 15 Office area
 - 16 Social housing high rise
 - 17 Social housing low rise
 - 18 Social housing medium rise
 - 19 Town Hall/council offices/ magistrate court
 - 20 University buildings main site
 - 21 University buildings student accommodation
 - 22 Waste Transfer Site
 - 23 Theatre
 - 24 FE College



large buildings/ large heating loads



Tips

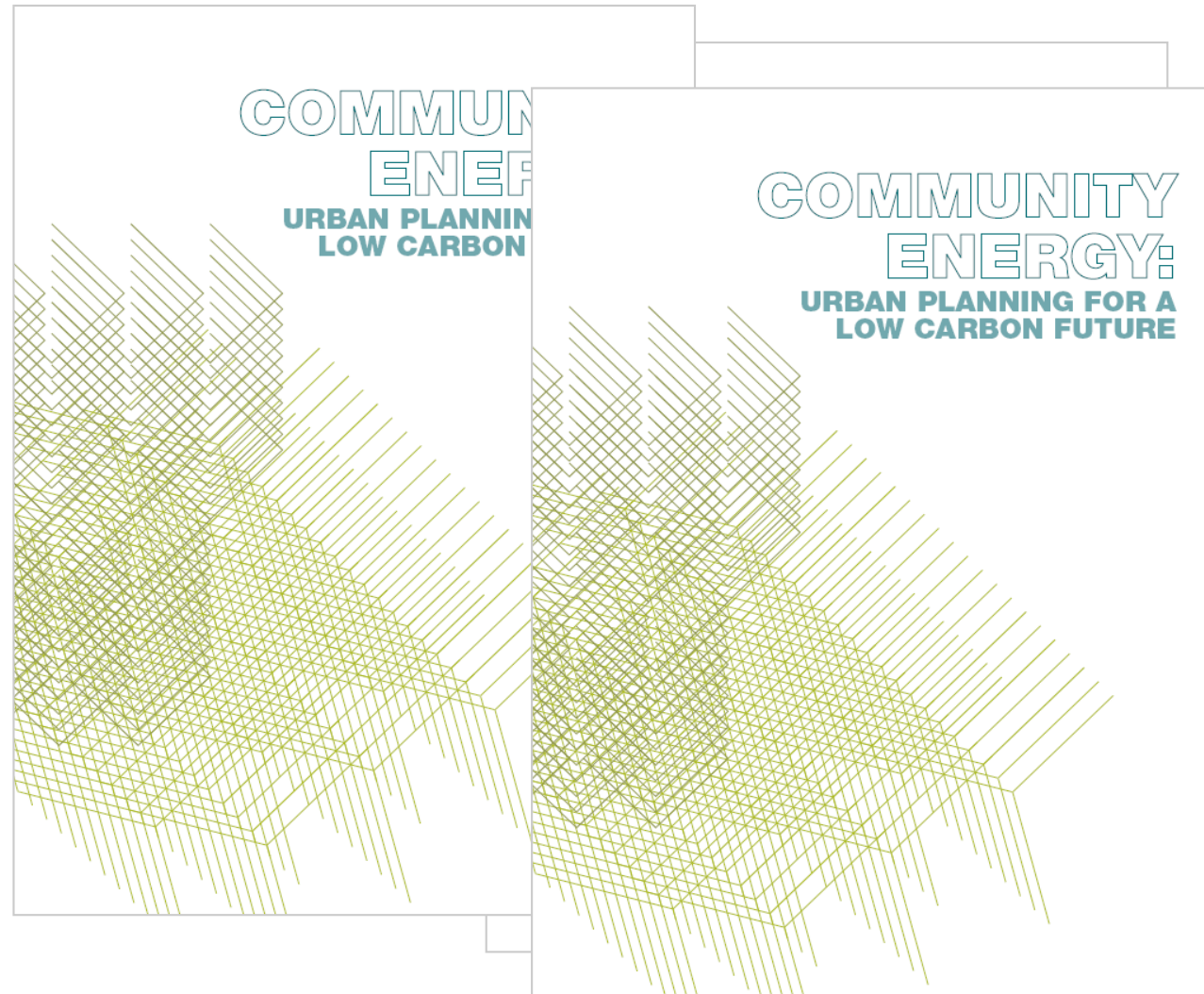
- Business case
- Organisational case
- Political case

- Have to think of who could benefit within the council, not just the direct customers
- Any written reports have to be drafted with the different possible audiences in mind

More tips

- Councils set up NOT to make decisions – to ration resources
- Lots of layers, lots risk of blocking or veto, or even just delay which threatens project
- Support of finance director is key
- Senior political sponsorship can be crucial
- Get all-party support if possible to guard against change of party control

Publications



CHPA 2020 Vision for heat networks

- Capitalise on apparent positive shift in attitude of UK Government to potential for retrofit DH
- Access new “state” funding streams: GIB, EIB, ECO and Allowable Solutions
- Access private capital at competitive rates
- Cut costs via standardisation
- Protect reputation through performance standards and consumer protection



Reduction in costs by standardisation

More work needed on contractual best
practice

*Reputation risk from lack of agreed
performance standards and consumer
protection*

(emphasis on this in 2009 Heat Strategy)

More work needed on best practice and
industry may need independent consumer
protection scheme

Overall objectives of the CHPA DHC Group Strategy

- To **capitalise** on, and maintain, CHPA's successful work to improve the UK and national governments' view of the role of district heating and cooling in decarbonising buildings
- To **influence and change governmental policy** to enable the building of substantial heat networks.
- To **change UK district heating industry practice** to enable objective one and two to happen.
- To **improve the economic model for district heating** in the UK, this will involve progress in the above objectives and should include bringing ***fresh sources of low-cost investment*** into the business.

Industry response: The “Big Offer” to Government

- response to the DECC Heat Strategy* (which contains no policy recommendations).
- Industry proposes
 1. ambition targets and
 2. policy recommendations to achieve them



*Consultation ends 24 May

Industry response: The "Big Offer" to Government (2)

The the industry should promise to introduce:

- an independent consumer protection scheme;
- a model Heat Supply Charter for households;
- a model pricing formula based on fuel cost; and
- contractual standardisation for householders and SMEs.

Visits to district heating

- Malmo
- Copenhagen
- Pimlico





More information

district heating & cooling

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Community Infrastructure Levy (CIL)

- new hypothecated local levy which local planning authorities in England and Wales can use to fund infrastructure in their areas

Simplicity

Q: Is this option straightforward for homeowners to understand and suppliers to deploy ?

A: Yes

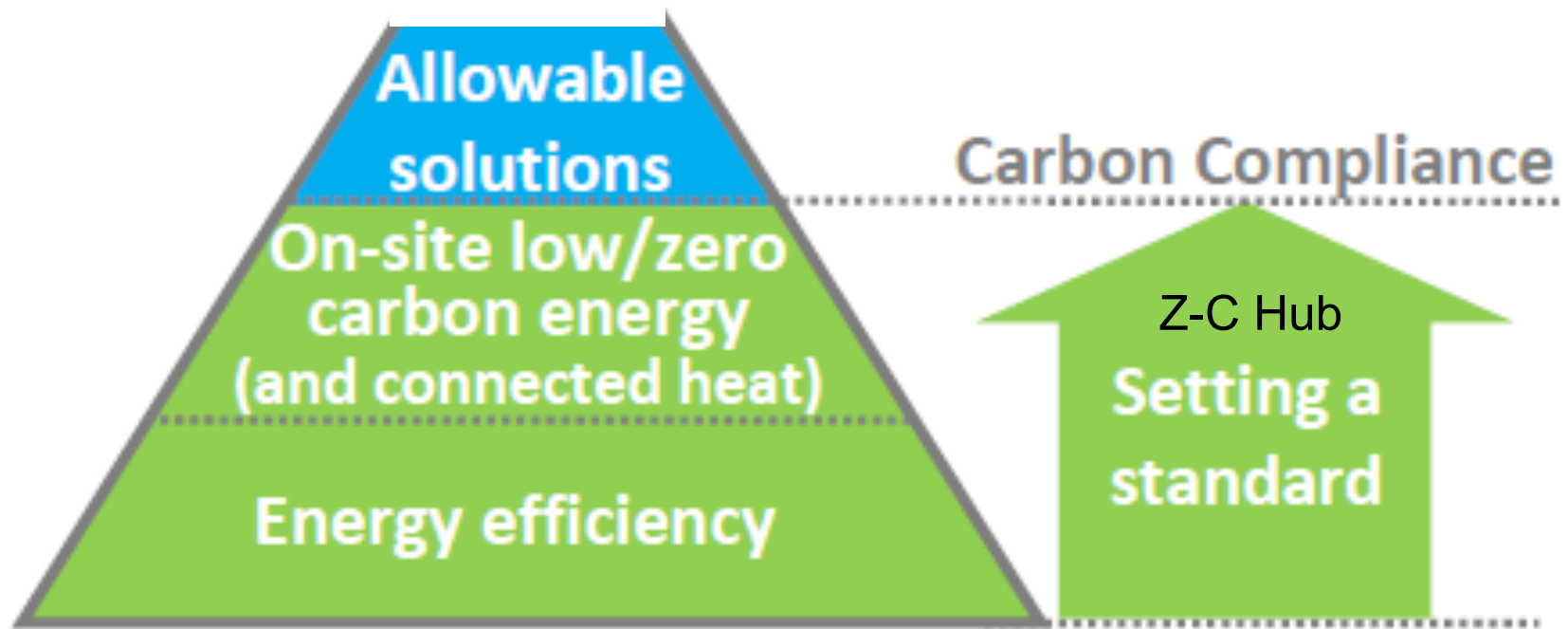
- UK-GBC survey showed that 74% of householders can see advantages of buying heat rather than having a boiler.
- District heating is mature technology where the costs are known and installation is a straightforward civil engineering project.

Understanding Consumer Attitudes to “Sustainable Community Infrastructure” UK-GBC Nov 2009

Building Regulations 2013 and 2016

Zero Carbon Homes by 2016
Zero Carbon Buildings by 2019

Budget 2011 halves Allowable Solutions



CHP and District Heating

