District energy: Today and the Future Potential

Peter Hamnett
Policy Specialist, UK District Energy Association
& Emergent Technology Specialist, Cofely District Energy
Presentation

- Who are we
- What is District Energy?
- Key Benefits
- A Little History
- The UK Market Today – key schemes
- The Future
Our Aims

UKDEA is a **Non Trade** not for profit association, working together to:

- Offer guidance to other organisations
- Raise awareness of district energy as a low carbon solution and the benefits that it can deliver
- **Members of the UKDEA gain the tools and support that they need to develop and expand their schemes**

"As a long time advocate of District Energy, I look forward to working with the UKDEA and their members to refine our approach“  - **Greg Barker MP - Minister of State for Energy and Climate Change**
Our Members

Our Members are from a range of **Public and Private** Sector Organisations:

**Full Members**
- Birmingham City Council
- Coventry City Council
- Enviroenergy Limited
- Leicester City Council
- Newport City Homes
- Southampton City Council
- Thameswey Limited
- Cofely District Energy Limited
- Ener-G Switch 2 Limited
- E.ON Energy Solutions Limited
- Newcastle City Council
- Shetland Heat, Energy & Power Limited
- SW Energy Limited
- Veolia Environmental Services Limited

**Associate Members**
- Aecom Limited
- Newman Insulation Limited
- ITM Power PLC
- Frontline Energy & Environmental
- Clarke Energy Limited
- RK Civil Engineers Limited
- Kantor Energy Limited
- Hampshire County Council
- Edina UK
- T Brown Group Limited
- Woodford Plastics Limited
- Evinox Limited
- Altecnic Limited
- Pipe 2000 Limited
- Itron Limited
- Gardiner & Theobald
- CPV Limited
- Secure Meters (UK) Ltd
- Linn Energy Limited
- INPAL Energy Limited
- Insite Energy Limited
- Institute of Energy, Cardiff University
- FES Renewables Limited
- City & County of Swansea
- REHAU Limited
- Junifer Systems Limited
- GTC Limited
- Econergy Limited
- SET ehf (Iceland)
- Mace Limited
- MVV Environment Limited
Our Work

- **Policy Research and Government Engagement**
  - Ensuring that district energy stakeholders’ views (both public & private sector) are effectively represented
  - Consultation analyses and responses
  - Meeting with officials

- **Technical Research and Forum**
  - Sharing technical issues and concerns amongst sector professionals
  - Exploration of delivering more low carbon technologies in a DE context

- **Guidance Document** – for local authorities and other organisations seeking to develop district energy in the UK
  - Balance of public and private sector perspectives
  - Case studies from members.
  - The Guide will spell out each step from Feasibility to Procurement and Contracts
What is District Energy?

Key Components:

Distribution Systems
What is District Energy?

Key Components:

- Energy Source
- Distribution Systems
- Consumer Interfaces
- End Users – “the Buildings”
Energy Sources

- Networks are ‘Technology Agnostic’
  - they don’t mind where the heat comes from
- The energy network is the priority
  - but consider the generation technology too
- The key principles must be:
  1. lower carbon
  2. lower cost
- Heat generation technologies can include:
  - Biomass – e.g. wood chip and pellets
  - Deep Geothermal
  - Energy from Waste
  - Gas Fired CHP
  - ... etc ...
Distribution Systems

- Buried networks in the UK generally use pre-insulated pipework.
- If there is an existing dry and accessible tunnel or duct then conventional, post-insulated pipework can be used.
- Plastic pipework is available in coils and requires fewer joints.
- Steel pipes are often used due to operating temperatures & pressures.

- Heat Losses < 1°C per km.
- Reliability ~ 100% (e.g. 99.98% for Southampton over 25 years).
- Networks last for > 50 years.
Consumer Interfaces

Commercial Connection:
– literally a cupboard, with massive space savings compared to conventional solutions

Example - Quays Swimming and Diving complex in Southampton.
A direct connection supplying heating and cooling for leisure complex with large swimming & diving pools
Consumer Interfaces

Domestic Connections:
Heating direct connection & DHWS via plate heat exchanger

Fabricated on site to suit dwelling

Or pre-fabricated off site, can mimic a combi-boiler appearance
The Consumers

- Very similar to typical building services systems
  - Rarely require substantial changes to wet heating systems for commercial consumers

- Low return temperatures are important
  - For efficient network operation
  - For good performance of the central low-carbon plant
  - Good practice variable volume system design:
    - Avoid bypasses between flow and return pipework
    - Variable speed drives
    - Flow rates may be considerably lower than consultants and designers are used to
    - Work with the energy service company
Why District Energy?

- One of the best ways to deliver substantial carbon savings in an urban area
- Ideal when there is a source of waste heat
  - If not, there are many potential generation technologies which can be used
- Remember networks are “technology agnostic” – they can be used to integrate many energy sources
- An energy generation “heart transplant” can be made several times in the life of the network as new technologies become viable
- By connecting several buildings, economies of scale can be achieved
  - Prevents token projects & “greenwash”
- Future proofing - whatever feasible thermal energy sources are available in the future can be “plugged into” the network
  - If buildings operate in isolation, this cannot cost effectively take place
- On a whole life cycle costing basis, DE can also deliver significant cost savings
Historically, district energy in the UK had a very bad reputation due to poor:
- installation → joint failures
- pipe systems → insulation/pipe failures
- control → poor heat distribution across the network
- water treatment → internal corrosion and pipe failure

ALL of these previous problems have now been resolved

New breed of schemes leading the way - earliest commenced in 1980s

Still only a relatively small number of large scale DE schemes in the UK ...
- Currently less than 2% of UK’s heat is from district heating

However, the message is finally being heard that DE works and many new schemes are being installed.
Together the UKDEA Members represent:

- Over 100 MW of low-carbon generation plant (CHP, biomass, EFW etc)
- Supported by hundreds more MW of conventional back-up boiler plant
- Delivering hundreds of millions of kWh heat each year
- Across energy networks which, if combined, would extend for more than 200 km
Existing District Energy Schemes
Owners and operators of the largest district energy schemes in the UK

We face the pains and successes of district energy on a daily basis

Joining the organisation will ensure you gain the tools to develop your scheme

Brings together the owners, operators and partners of the largest district energy schemes in the UK

Together these schemes save over 100,000 tons of CO₂ emissions per annum

We develop, operate and expand district energy schemes on a daily basis

- Olympics and Stratford City
- Bloomsbury Heat & Power
- Whitehall

London –

- Manchester
- Sheffield
- Leeds
- Birmingham
- Edinburgh
- Nottingham
- Leicester
- Milton Keynes
- Southampton
- Woking
- Lerwick
- Newcastle
- Exeter
Leicester District Energy Scheme

25 Year Energy Services Contract with Leicester City Council

- CHP and large scale district networks - £15M investment
- 3,000 Council Dwellings
- 15 Administration Buildings

Leicester District Energy Scheme
5 MW Gas Turbine
CHP

Providing heat & standby power to

20 Government depts

Whitehall Distribution Centre, London
City Wide DE Scheme

70,000,000 kWh energy generated p.a.
11,000 tonnes CO2 saved p.a.

Providing heat chilled water & electricity to

45+ commercial consumers
800+ residential consumers

Southampton Geothermal Heating Company, Southampton
Colindale, NW London

600 kW CHP

500 kW biomass boiler

1,065 residential units
Hotel and College
Lerwick District Energy Scheme

Energy from Waste replacing reliance on oil boilers

By 2010
6,000 tons of fuel oil displaced
15,000 tons of CO2 saved

8,000 residents

Lerwick District Energy Scheme
1.2 MW CHP and tri-generation
Private Wire
Island mode operation
Olympic Delivery Authority
Energy Centres for London 2012

£100 million investment
40 year concession

16 km of energy network
2 energy centres (district heating & cooling)
The Future

- Fuel Agnostic Networks
  - Geothermal
  - Biomass Boilers
  - Anaerobic Digestion
  - Fuel Cells
  - Heat Pumps
  - Industrial heat
  - Biomass gasification CHP
  - Biomass ORC CHP
  - Energy from Waste
  - Power Station CHP
The Potential

[Graph showing potential over time]

- Heat Delivered
- GHG Saved
14% of the UK’s heat from low-carbon district heating by 2030

Total decarbonisation of these networks would result in greenhouse gas emissions savings of circa 36 million tonnes $\text{CO}_2\text{eq}$ per annum (a 26% reduction).

36 million tonnes annual greenhouse gas savings translates to 1.8 billion lifetime tonnes abated greenhouse gas emissions

Thousands of jobs created to install and maintain these schemes

Billions of pounds of cost savings for the public & private sector
DECC’s Heat Strategy

DECC’s strategic vision outlined for consultation, March 2012:
1. Managing Heat Demand in Buildings
2. Transforming Building-Level Heating
3. Developing Heat Networks in the UK
4. Transforming Industrial Heat
5. Framework for Action
DECC’s Heat Strategy

- Recognition of the part District Energy has to play

- DECC’s strategic vision outlined for consultation March 2012
  - Developing Heat Networks in the UK:
  - “Heat networks are compatible with a wide range of heat supply options and provide a way to distribute low carbon heat, which makes them easily upgradeable”
  - “Much more is needed for heat networks to reach their full potential in this country”
What do we Expect?

- **Policy Paper expected March 2013**

- Government is still ambitious about the role of district energy

- No new funding expected

- National District Energy Delivery Unit

Thank you

Questions?

Please contact:

Simon Woodward – Chairman of the UKDEA
chairman@ukdea.org.uk

Chris Tanner – Secretary of the UKDEA
secretary@ukdea.org.uk