



Cheshire and Warrington low carbon skills fund programme

Delivering local energy networks on the ground



Introductions

Mike Smith

**Non-Executive Director
&
Public Sector Advisor**

Cofely District Energy

Presentation

- **Why Take a Thermal /Cooling Connection**
- **Key Roles of Local and Public Authorities**
- **Characteristics of Successful Projects**
- **GDF SUEZ, Cofely and Cofely District Energy**
- **Project Examples**

Why Take a Thermal/Cooling Connection ?

- **Capital cost savings – connection charge up to 20% less than conventional plant**
- **Space savings – direct connections mean no plant space required – very valuable in urban areas**
- **No roof mounted plant – planning gain**
- **Operating cost savings – up to 10% when compared to the alternative cost of heating/cooling (Cofely Business Model)**
- **Guaranteed savings – prices linked to basket of indices to ensure savings maintained throughout life of the contract**
- **Delivers on carbon saving targets and indicators**
- **Ensures full and genuine outsourcing of energy supplies = risk transfer**

Key Roles of Local Government & Public Authorities in development of integrated energy schemes

- **Strategic planning, City Design & Development control**
- **Persuading owners & occupiers to link to schemes**
- **Leverage as land & property owners**
- **Licensing and way leaves for mains & cables**
- **Councils are large potential customers**
- **Best Practice dissemination**
- **Influence regional, national and European Government**
- **Meeting national and local obligations**
- **Governance**

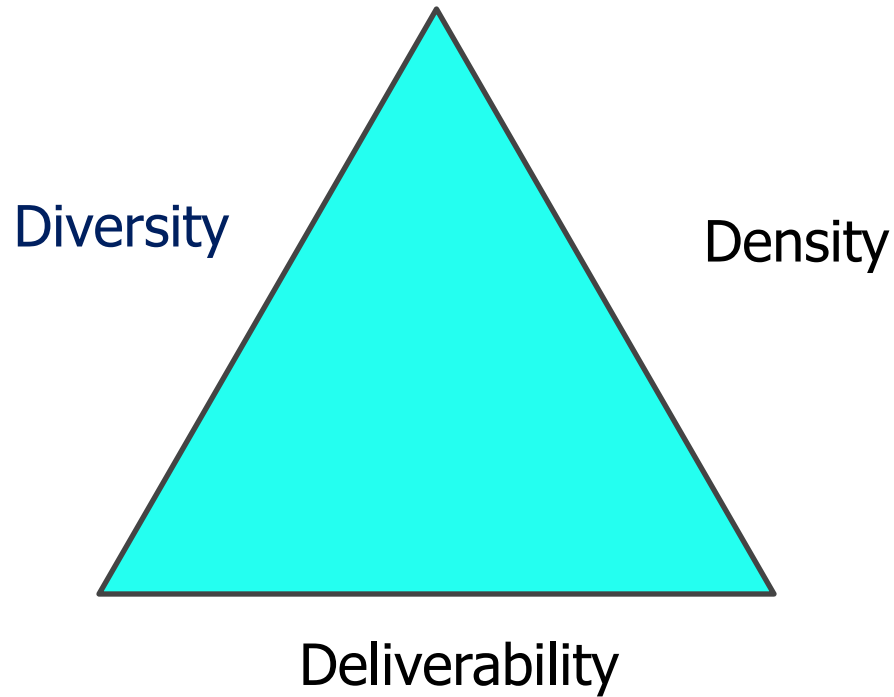


Characteristics of Successful Projects

COFELY
GDF SUEZ

COFELY
District Energy Limited

The DE Triangle



What does it mean?

- Mix of building types
- Usage at different times of day/year
- Usage for different loads - DHW; space heating; process heating
- Existing buildings – a function of the existing urban geography
- New Developments – mixed use is quite common for larger developments

Why is it important?

- CHP and other low carbon plant operates optimally at continuous output
- Diverse loads provides year round baseload
- Increases CO₂ savings and financial viability
- Can reduce peak demand significantly

What does it mean?

- Heat density (kWh/m²)
- Proximity of buildings

Why is it important?

- Reduces capital cost due to reduced network costs
- Reduces highway buried services risk
- Increases financial viability

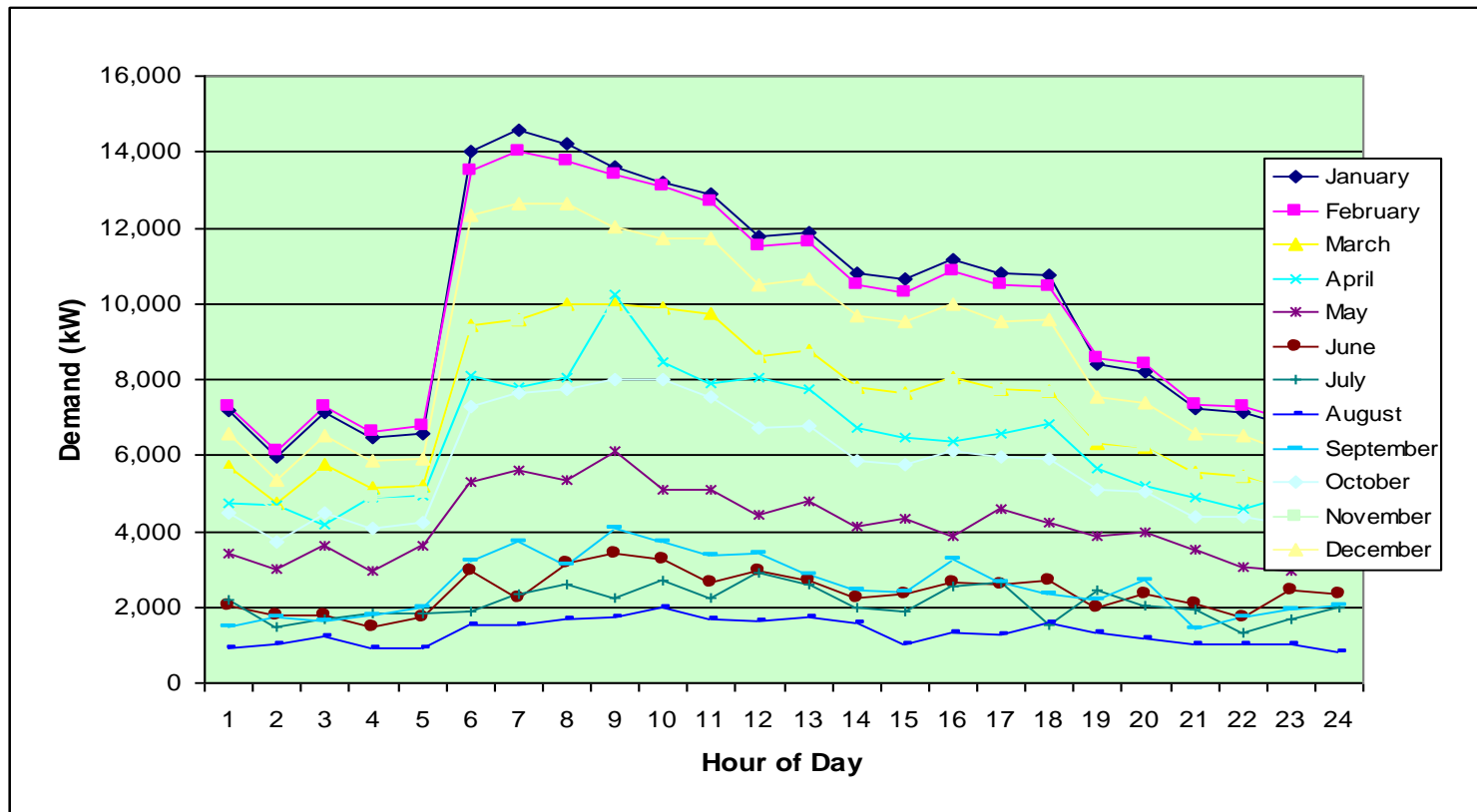
Several key issues including;

- Potential for long term contract
- Number of customers
- Nature of customers
- Revenue certainty and financability
- Timing (phasing of loads)

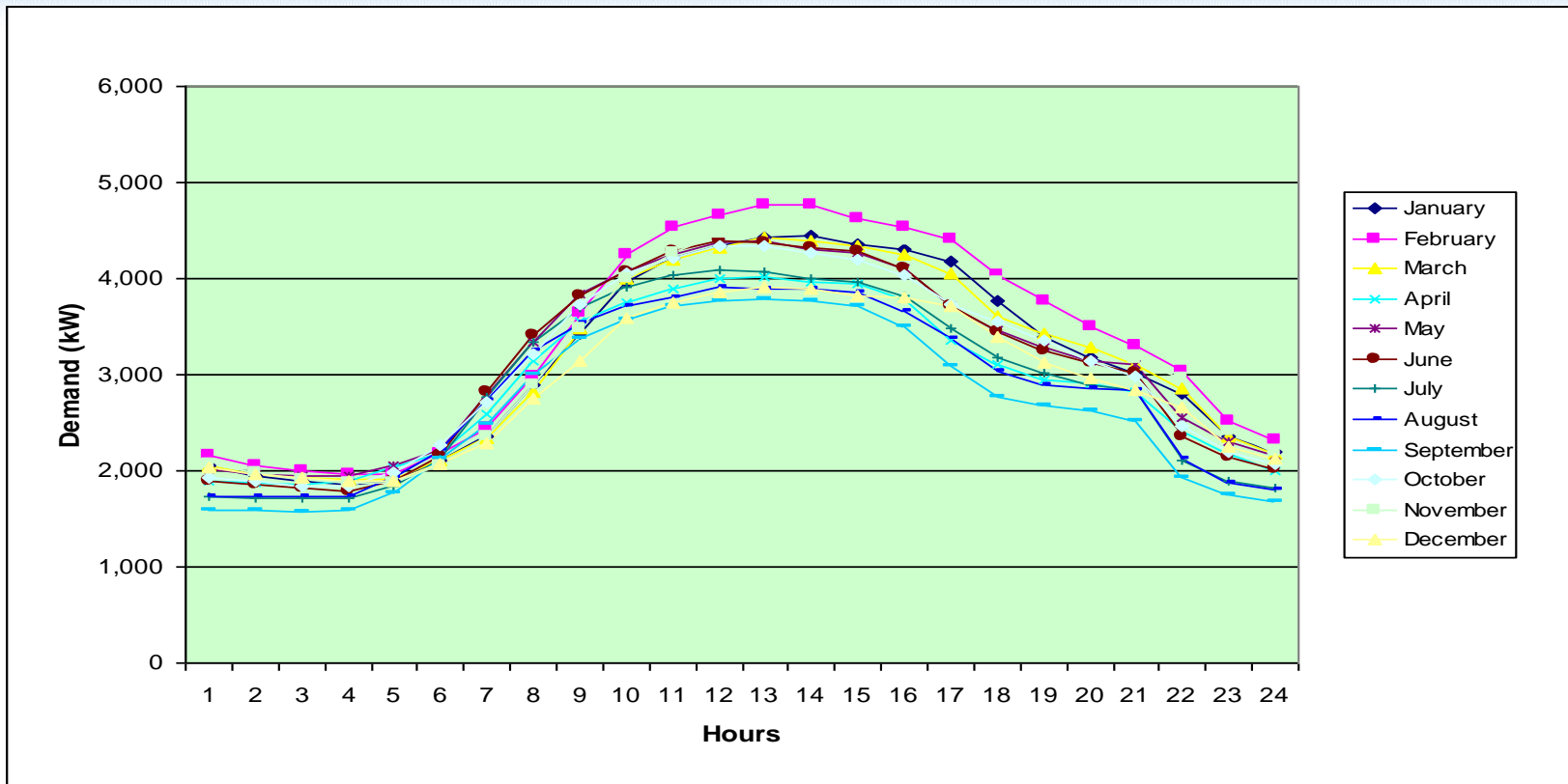
Key questions;

- Who would the contracting party be?
- How much of the project can they commit?
- Does this provide sufficient certainty around energy consumption, energy sales and appropriate plant selection?

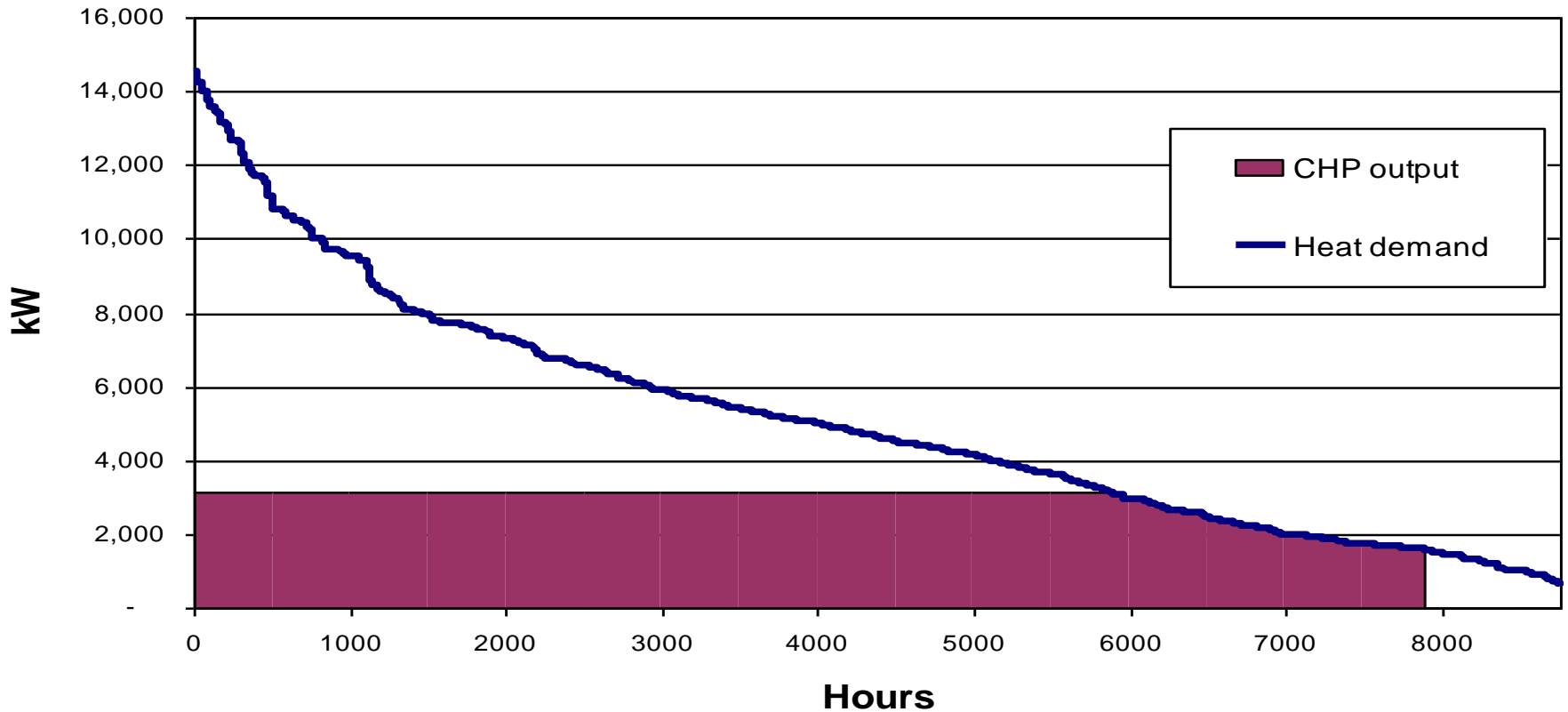
Heat Demand Profiling



Electricity Demand Profile

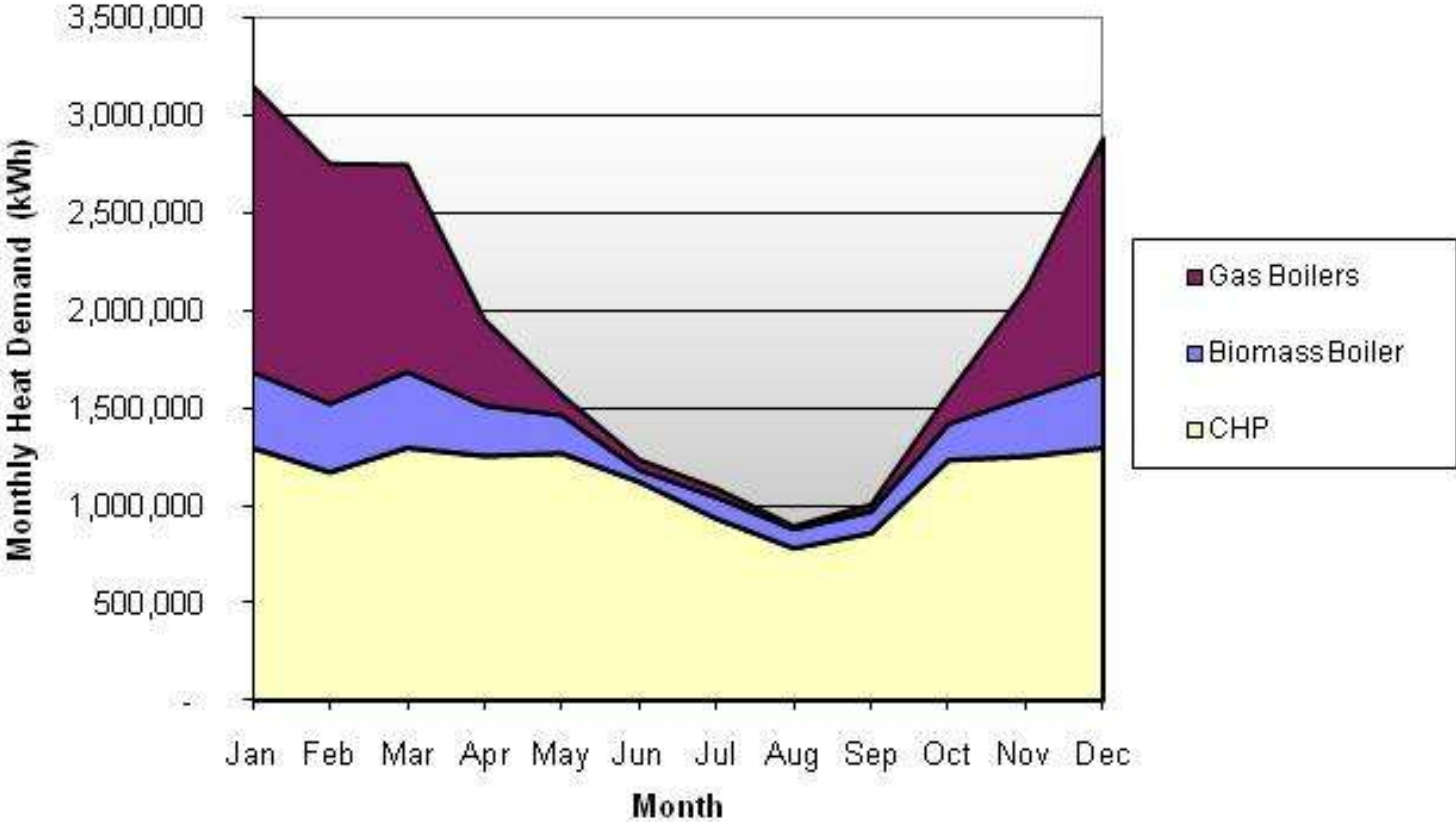


Annual Heat Duration Curve



Combination of Plant

Monthly Contribution to Total Heat Demand from Combustion Systems



District Energy

Piping heating & potentially cooling to buildings – “Energy Linking”

Heat Losses - 1°C per km

Reliability ~ 100% (99.98% for Southampton)

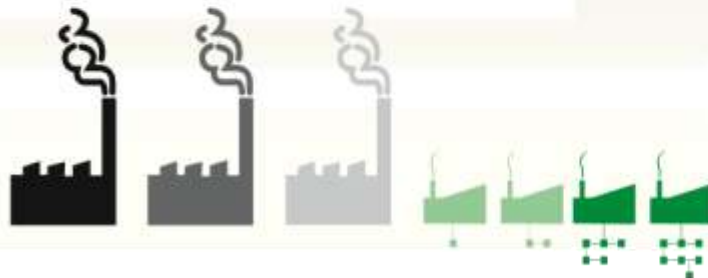
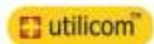
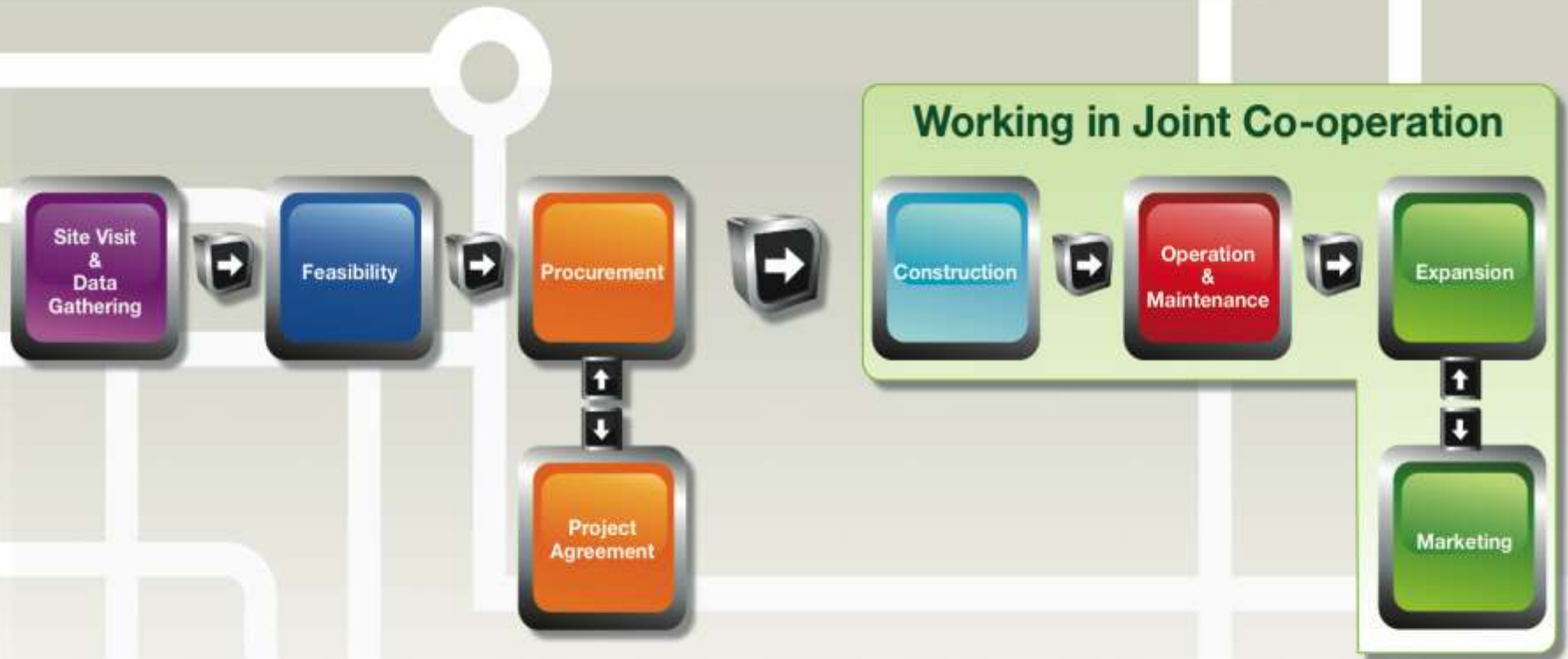


District Energy delivers:

- ✓ **financial savings**
- ✓ **carbon savings**

ROUTE MAP

To Delivering Low Carbon Decentralised Energy Schemes



Site Visit and Data Gathering

Site Visit & Data Gathering



Gather Information on Other Schemes –

- Brochures
- Technical Summaries
- Strategy of successful Local Authorities
- View plant/technologies

Develop Relationships

- Meet the people and organisations involved in these schemes
- Introduce decision-makers, councillors and senior management to the idea of low carbon energy networks
- Develop relationships with existing ESCO's and O+M providers

Review Consumer Types/Mix for your Potential Scheme

- Public Sector
- Private Sector

Benchmark – Ideas/Concepts

- Discuss concepts and timescales with the experts
- Understand the experience of similar organisations/authorities



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Birmingham City Council

SOUTHAMPTON
CITY COUNCIL

Decentralised Energy
DEKB
Knowledge Base



Feasibility



Commission a Feasibility Study which will Report on:-

- An introduction to low carbon energy networks and their technologies
- Building types considered for connection
- Project Design Considering:-
 - Potential energy centre location
 - Technologies
 - ◆ District heating/cooling
 - ◆ Cogeneration
 - ◆ Tri-generation
 - Planning considerations
 - Energy distribution network
- Operational and Financial Modeling
- Projected capital costs
- Grant sources
- Frameworks for developing low carbon energy networks
 - Financing Options
 - Risk transfer/Outsourcing
 - Procurement Routes
- Potential future expansion of the scheme
- Implementation program



Procurement



Stages of Procuring a Project

1. Issue of OJEU Contract Notice

- State what you are procuring: Energy on a long-term output specification basis
- State which parties will consume energy
- Value of Project over contract term

2. Pre-qualification Questionnaire (PQQ) issues to Consider:

- Supplier Quality
- Supplier's Experience
- Supplier's Financial Status
- Health & Safety

3. Prepare Invitation to Negotiate

4. Documents Issued, to contain:

- Scope of project
- Output specification
- Technical specification
- Economic and environmental targets
- Past feasibility studies
- Evaluation matrix
- Draft preferred form of contract
- Risk Matrix for completion by bidder

5. Conduct Tender Interviews

6. Select Preferred Bidder

7. Develop Final concept in Partnership with Preferred Bidder

8. Enter Commercial Discussions



Project Agreement



Key Components of Commercial Analysis

- Open book Financial and operational modeling
- Developed on "whole life-cycle costing"

Key Clauses within the Project Agreement

- Obligations of the Service Provider
- Obligations of the Consumer
- Term/duration
- Joint Co-operation
- Payment/Indexation
- Demarcation of responsibility
- Change of Law
- Force Majure
- Termination
- Liabilities/ Indemnities

Key Schedules within the Project Agreement

- Forms of leases/wayleaves/easements
- Output specification
- Annual reports
- Drawings
- Financial model

Payment Considerations

- Connection fees (where applicable)
- Energy charging structure – fixed/unit charges
- Indexation mechanism
- Financing of the project (bank/inter company)
- Profit share/energy rebate arrangements
- Performance measurement and deductions
- Fuel procurement strategy (fixed term/floating)
- Long Term Replacement strategy of plant/infrastructure



Construction



The Stages of Construction

- Define the scope
- Produce outline and detailed designs
- Develop a detailed project program to meet the Operational Start Date (OSD)
- Appoint subcontractors
- Enabling Works
- Removal of Existing Plants
- Builders Works
- Installation of new M&E Plants
- Commissioning and Testing

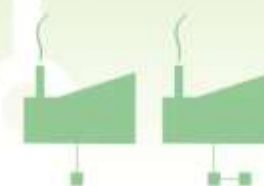
Consider Health and Safety issues at all times

Construction Considerations

- Interim operational period until new plant is online
- Warranties from key suppliers
- Wayleaves, easements, highways (section 50 applications) leases and planning approval
- Traffic Management
- Co-ordination with major events
- Co-ordination with other utilities
- Removal of Asbestos/Hazardous Substances
- Access for delivery of major plant
- Managing switchover to new energy supplies

Completion and Handover

- Drafting of O&M manuals
- Insurance for new plant
- Performance testing



Operation & Maintenance

COFFELY



Elements of Maintenance to be considered

- Planned preventative maintenance to maximise availability & reduce costs
- Maximise life of assets
- Forward planning and resourcing for long term replacement/repair

O&M Specialist Contracts Requirements

- Output specification
- Supply of annual reports
- Period of agreement
- Service level agreements in place
- Performance measurement and deductions

Controls and Monitoring

- Building Management System (BMS)
- Metering
- Remote monitoring

Further Considerations

- Communication between partners
- Risk transfer to ESCO/third party
- In-house/contracted
- Disaster recovery plan

Operation

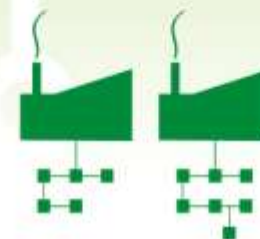
- Match operation of plant with consumer demand
- Monitor efficiency
- Ensure plant resilience and standby capacity is available
- Maximise revenue/reduce costs

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Expansion



Identifying Opportunities for New Energy Connections by:

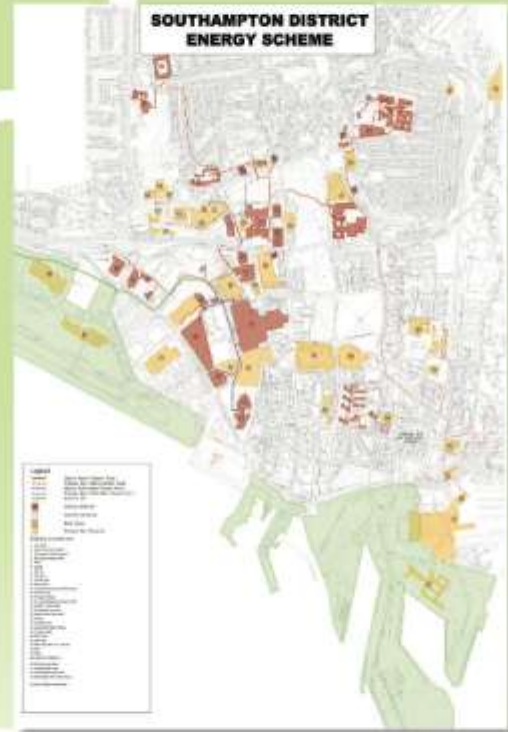
- Liaison with Planning Officers
- Liaison with local developers
- Conversion of existing Local Authority/private stock to connect
- Interaction with Regional Development Agencies
- Joint Co-operation provisions:
 - Strategic board meetings
 - Section 106 agreements
 - Connecting public sector buildings
- Considering new energy streams, i.e. addition of cooling

Funding Streams for Expansion

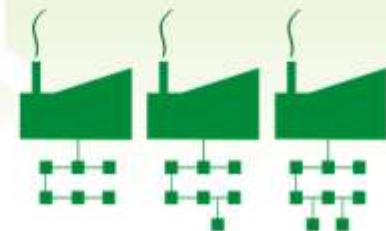
- Private equity funding
- Connection fees
- Grant funding

Approach/Target Desirable Consumers:

- Hotels
- Hospitals
- Schools
- Leisure centres
- Care homes
- Housing schemes/ associations



Continuously review new Low Carbon Technologies



Marketing



Events/ Promotions

- Senior dignitaries/ministerial visits
- Scheme visits for potential consumers/LA's
- Scheme visits for other Local Authorities
- Scheme/connection launches
- Award applications/ ceremonies
- Conferences

Use Media

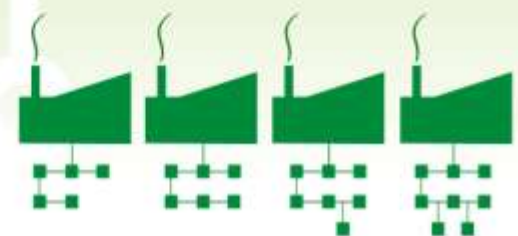
- Scheme brochures
- Good practice guides
- Press releases
- Website

Promote the Environmental Benefits

- Industry seminars
- Educational programs
- Carbon calculators

Engage with Associations

- Association membership i.e. ukDEA



Cofely and GDF SUEZ

GDF SUEZ: The Business Lines



Global Energy Company

197,000 employees

Turnover €83 billion

6 Business Lines **COFELY**
GDF SUEZ

ENERGY FRANCE

ENERGY EUROPE
&
INTERNATIONAL

GLOBAL GAS &
LNG

INFRASTRUCTURES

ENERGY SERVICES

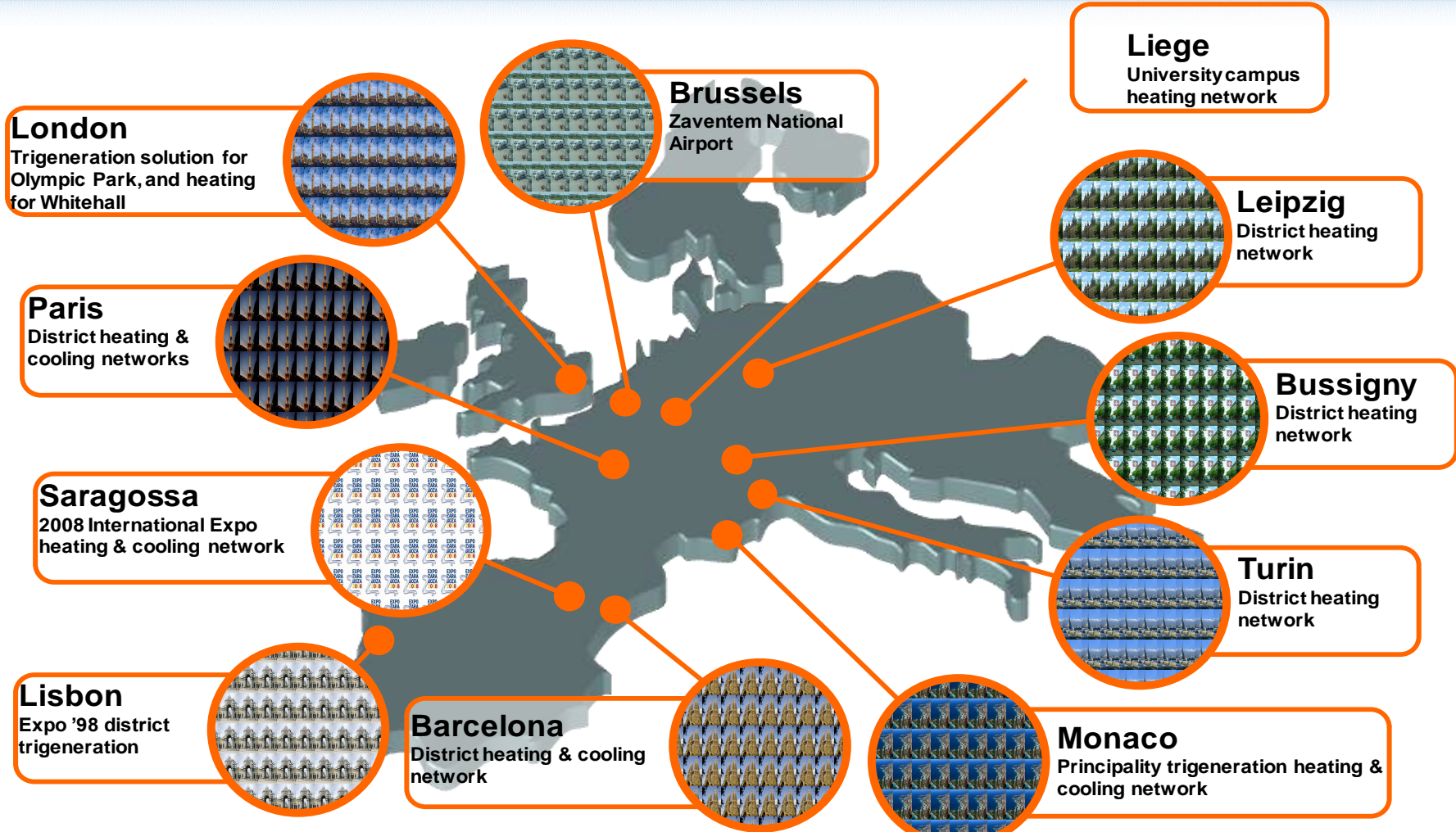
ENVIRONMENT

€14 Billion turnover
17% of the group's turnover

80,000 employees
40% of total GDF SUEZ Staff

1,300 locations in Europe
30 Countries

Cofely - sample of European Schemes



GDF SUEZ in the UK

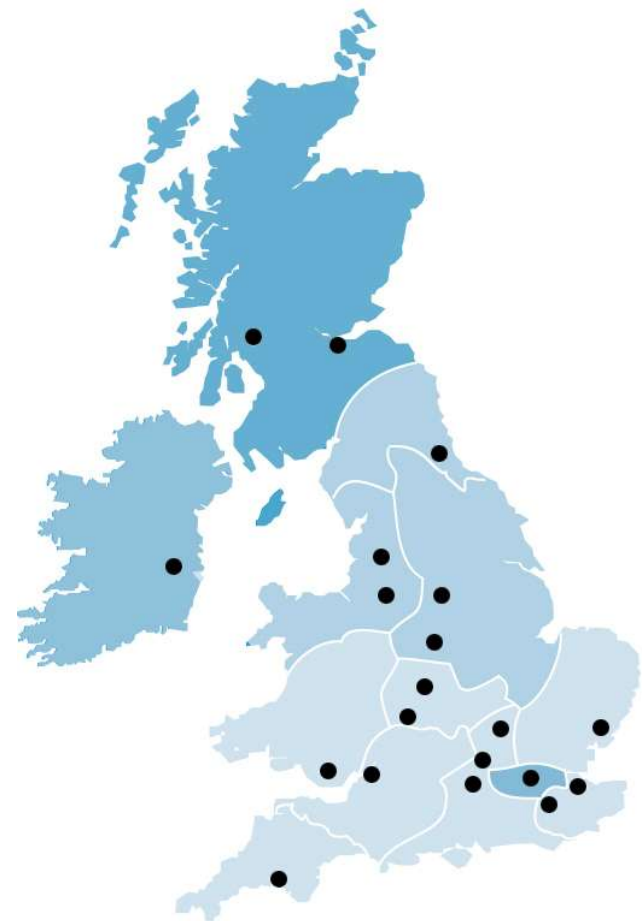
£500 million turnover

2,700 employees

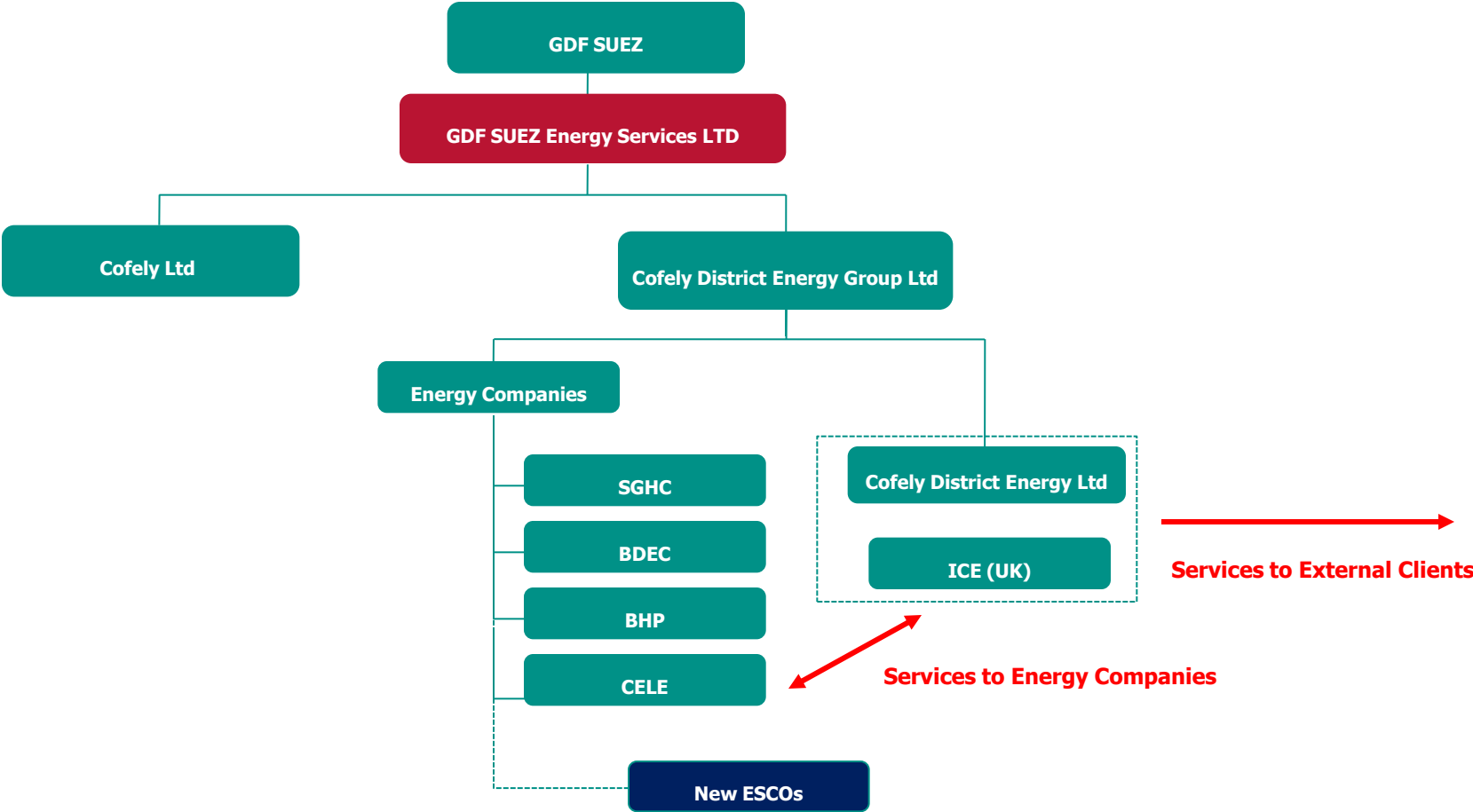
22 regional offices

13,000 Customer sites

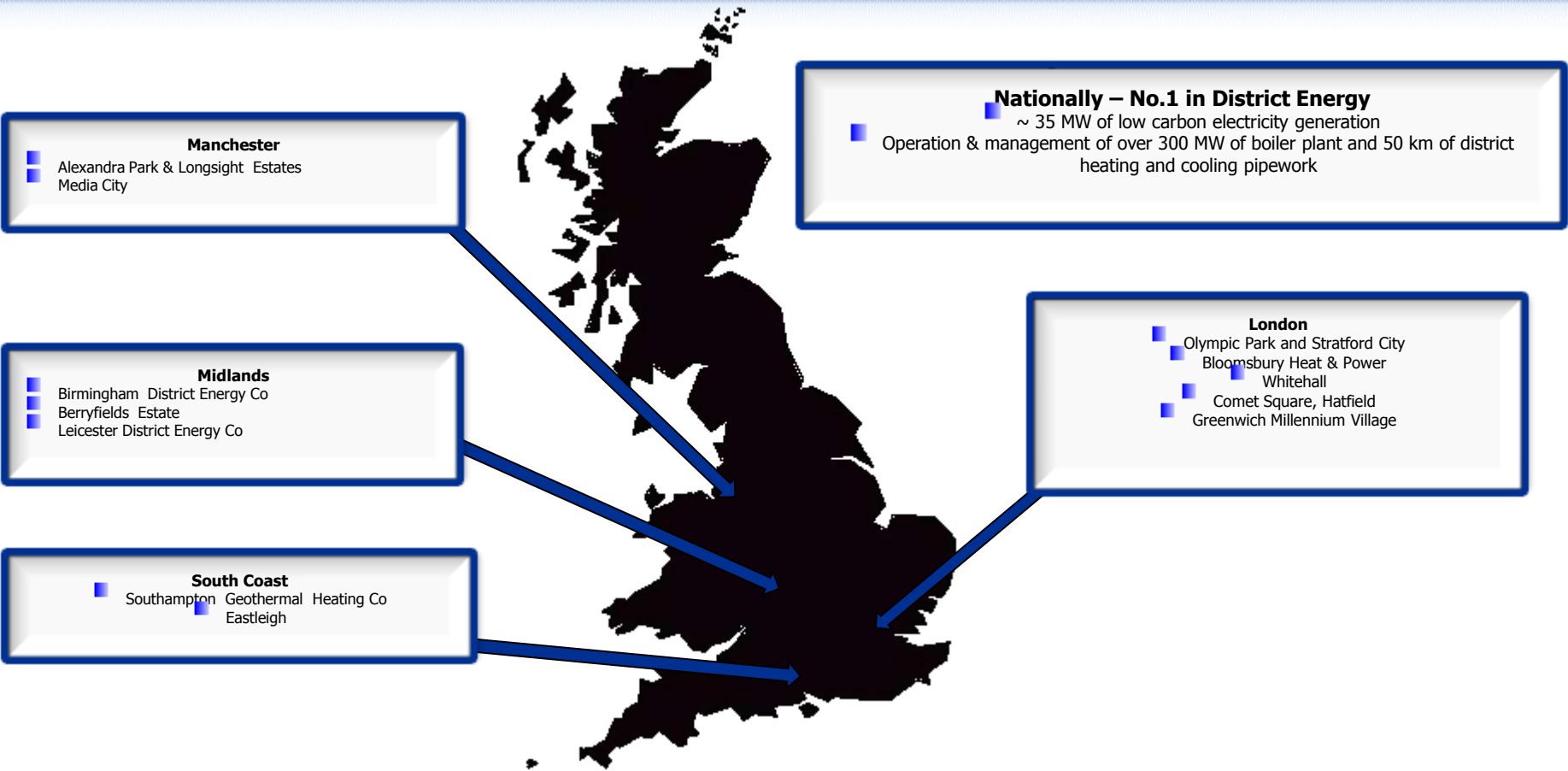
12.4 million sq m of managed space



Cofely District Energy



Cofely District Energy



Our Experience

- **45 years developing Community Heating, CHP and District Energy Schemes across Europe**
- **Developers and Operators of largest commercially developed district energy scheme in the UK**
- **Southampton District Energy Scheme – 21 years in operation**
- **Also written the UK's standard guidance – "Guidance on procuring energy services to deliver community heat and power schemes"**
- **Winner of the 2006 National Energy Efficiency Awards for Energy Services**
- **Winner of the Queens Award for Enterprise – Sustainable Development 2001 & 2008.**



CDE – Our Approach

- **Long term partnering agreements with flexibility to adapt**
- **Fully funded/risk outsourced business model**
- **Core thermal networks serving existing buildings**
- **Networks are technology neutral**
- **Innovative solutions to improve economic viability**
- **Expansion of thermal networks, improving diversity, increasing the thermal baseload and introducing more low carbon plant**
- **Plans to introduce thermal waste and biomass plants to established networks**

CDE Capabilities

Over 20 years experience of district heating and CHP in the UK
Stable and directly employed operations teams
In house design and project management capability

- Design**
- Build**
- Finance**
- Own**
- Operate**
- Maintain**

Full risk outsourcing with a reliable and experienced partner



Group District Energy Projects

Case Studies

COFELY
GDF SUEZ

COFELY
District Energy Limited



16 km of energy network

2 energy centres
(district heating & cooling)

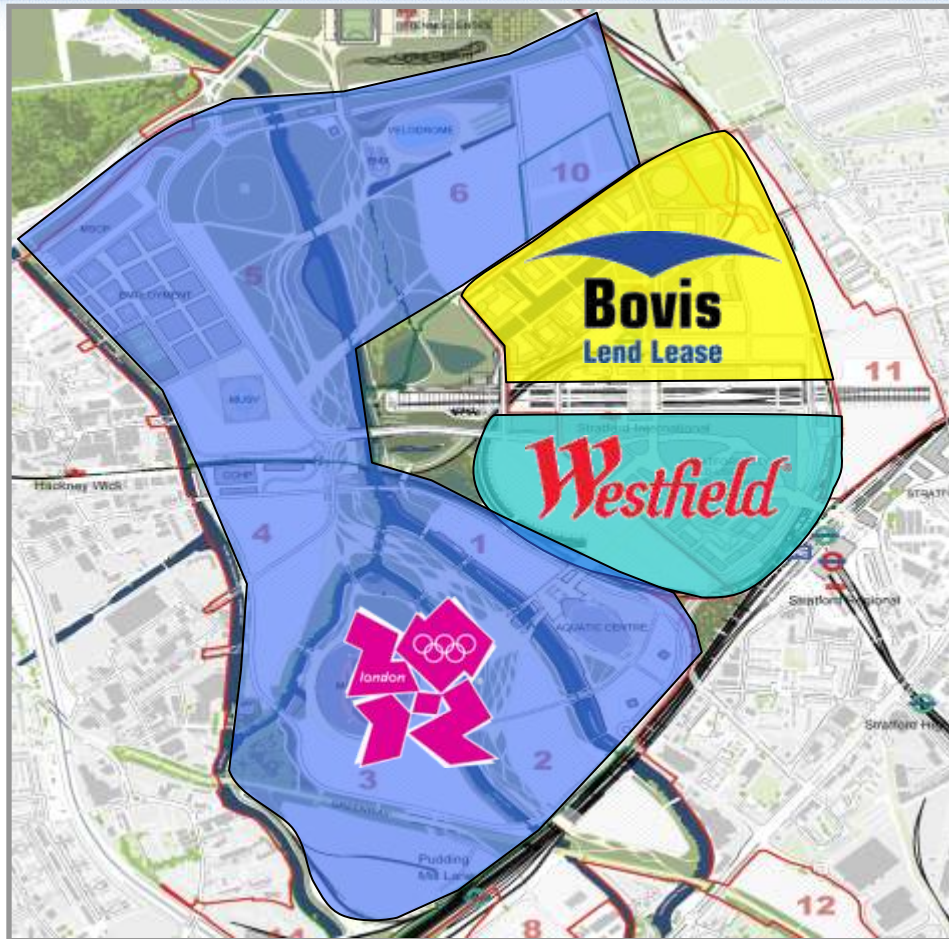


£100 million investment

40 year concession

Olympic Delivery Authority
Energy Centres for London 2012

Olympic Park & Stratford City: Concession Area



Three Major Development Areas:



Olympic Delivery Authority (ODA) for the Olympic Park



Bovis Lend Lease for the Olympic Village



Westfield for Stratford City

Key Deliverables & Outputs

- Supply heating and cooling for:
 - London 2012 Olympic Games
 - Major regeneration area of Stratford City

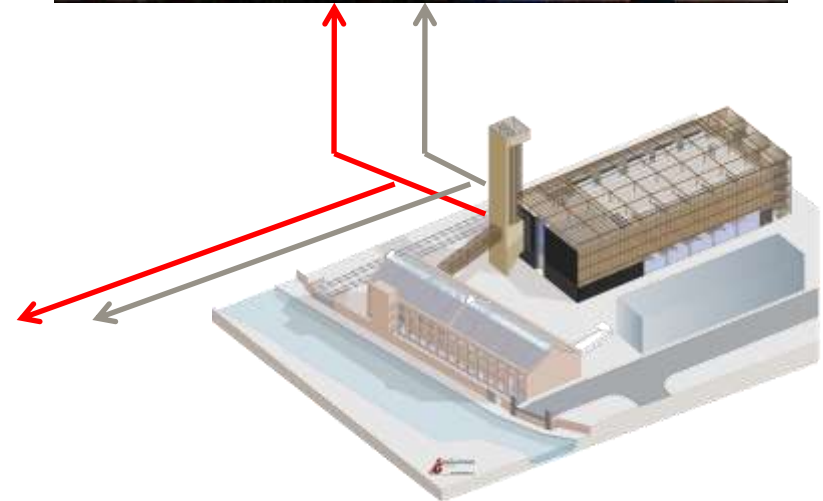
Olympic Park & Stratford City: Installed Energy Plant

Energy Centre 1 (Olympic Park)

- 3.1 MWe CHP
- 4.0 MW Absorption Chiller
- 3.5 MW biomass boiler
- 40 MW conventional boilers
- 14 MW VC Chillers

Energy Centre 2 (Westfield Stratford)

- 6.2 MWe CHP
- 4.0 MW Absorption Chiller
- 40 MW conventional boilers
- 35 MW VC Chillers



Olympic Park & Stratford City: Sustainability Credentials

Carbon Savings (Core Consumers):

- ~11,700 tonnes p.a.
- 24% reduction over conventional generation.

**Energy is provided without a “Green Premium” to consumers.
Maximum use of recycled materials during construction process;**



Olympic Park & Stratford City: Contracting Arrangements



£100M investment by COFELY:

- Funded under a 40 year Concession Agreement between COFELY, Stratford City Developments Ltd and ODA.
- The Concession Agreement:
 - Provides an Area of Exclusivity to COFELY for the term of the agreement;
 - Sets out terms whereby heat and cooling is supplied to consumers;
 - Requires carbon savings to be delivered as compared to conventional energy sources.

COFELY is:

- Designing, Building, Financing and Operating (maintaining, repairing and replacing):
 - All plant contained in 2 Energy Centres;
 - All sub stations;
 - All heating and cooling networks (from the Energy Centres to Consumer interface points).

Olympic Park & Stratford City: Consumers

Main Stadium



Aquatic Centre



Athlete's Village/Legacy



Veladrome



Energy Centre(s)



Westfield Stratford



200 acre site

Contract for Peel Holdings

Trigen and District Heating
Installation

New home of 5 BBC
departments from 2011

Mediacity:UK, Manchester



11 year contract

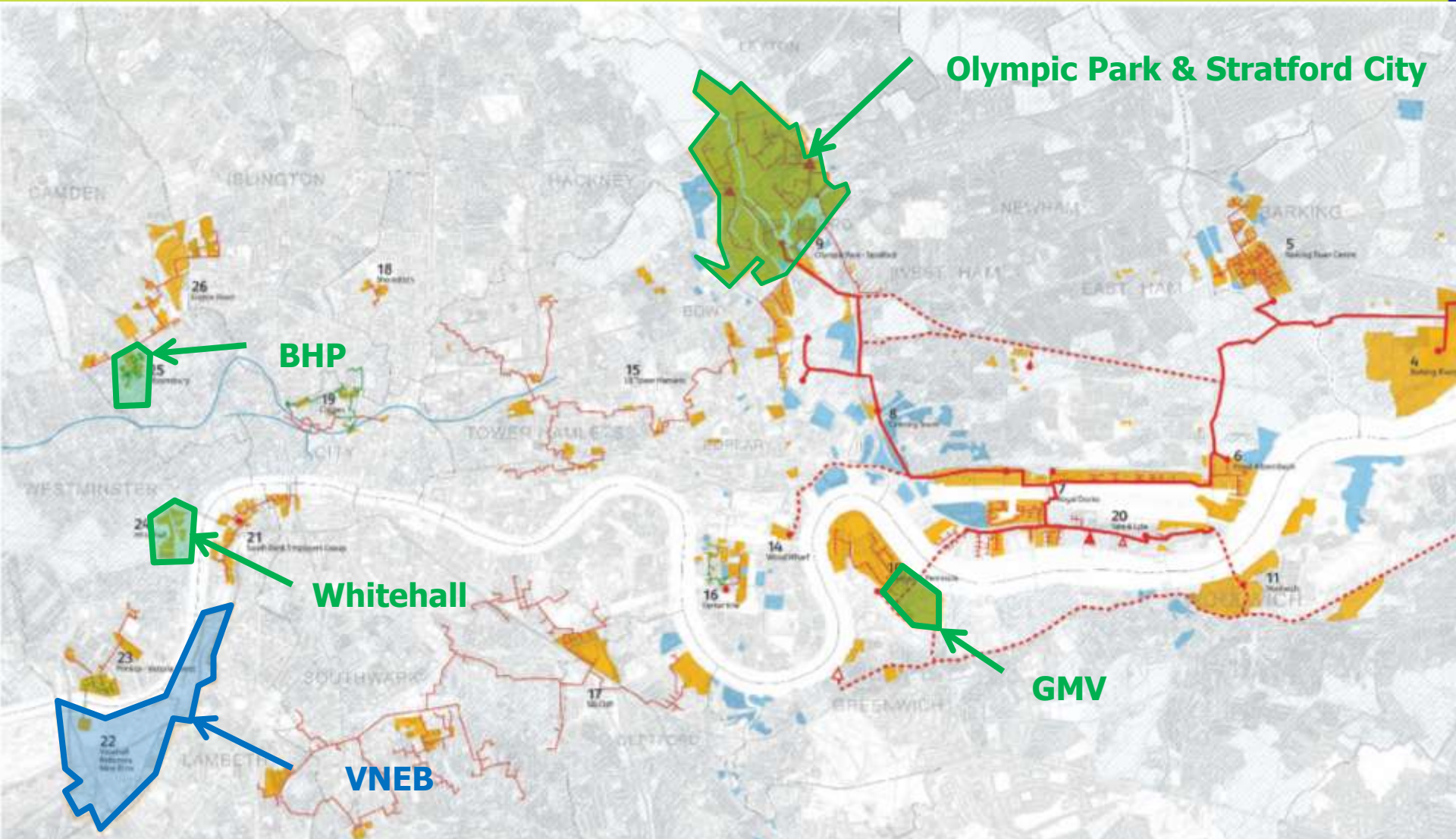
Operation & Maintenance
of two energy centre
plantrooms

Providing heat & standby
power to

20 Government depts

Whitehall Distribution Centre, London

CDE: Hub for London Heat Networks





25 Year Contract with
Leicester City Council

CHP and large scale district networks -
£15M investment

3,000 Council Dwellings

15 Administration Buildings

Leicester District Energy Scheme

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

Southampton - A City Wide Sustainable Community



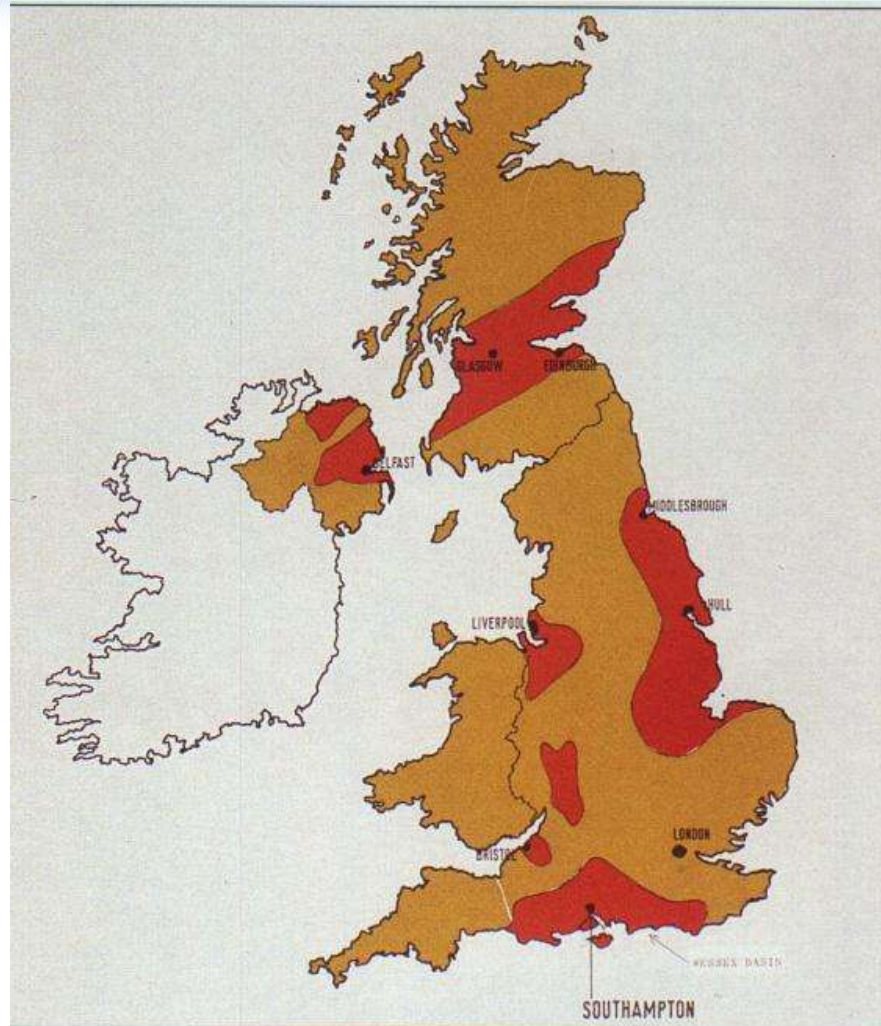
a partnership between



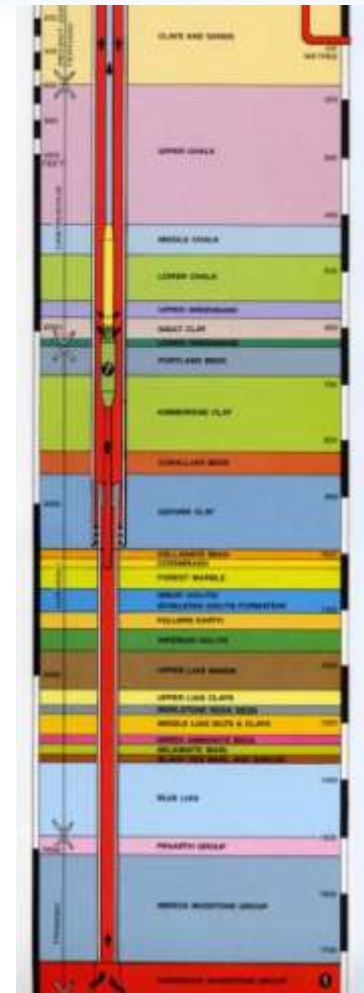
and



The Catalyst - The Geothermal Well and Resource



The Rock and the Pump



Southampton - Key Features

- Largest commercially developed CHP/district energy scheme in the UK
- Started 22 years ago
- Built on Joint Co-Operation Agreement with Southampton City Council
- £5M Energy Sales
- £0.6M p.a. cost savings to consumers.
- 11,000 tons of CO₂ emissions saved p.a.
- 8 MW of CHP, geothermal well, and 1 MW biomass in 2010
- Supplying heating, cooling and electricity
- 14 km pipe network
- Project built on 20 year energy supply contracts
- Capital cost to date £12M

The 5.7 MW CHP being delivered



**Proposed new 1
MW Biomass Boiler**



Southampton Energy Centre



Parkview



Civic Centre



RSH Hospital



BBC TV Studio's



Southampton Solent University



Skandia Life

ABP



The Heat Station



West Quay

IKEA



Carnival



Quays

DeVere Hotel



New for 2010/11



New Police HQ



Capita - Regional Business Centre

West Quay Phase 3 Watermark



A partnership between:



The History

BCC has long held a vision to develop large scale sustainable energy supplies across the City

First Steps were in 2003:

- Initial Feasibility Studies
- Visit other schemes

Two schemes were identified in 2003:

- Broad Street – core buildings ICC, NIA, Hyatt Hotel & various key BCC Buildings
- Eastside – Aston University, Birmingham Children's Hospital and BCC Buildings

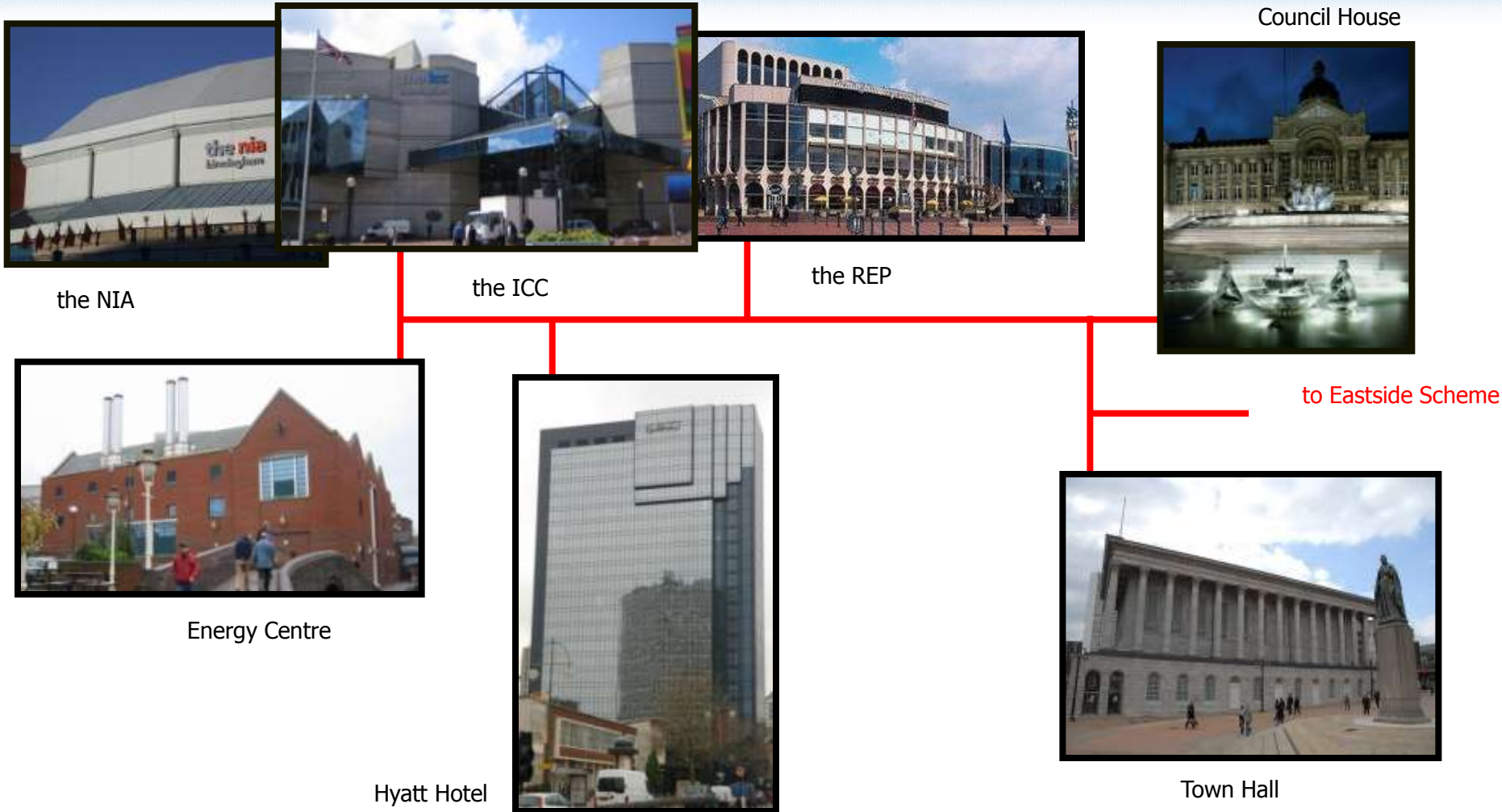
The History - timeline

- **Tenders were issued for delivery 2005**
- **Utilicom was selected as preferred partner, Sept. 2006**
- **Utilicom Group formed wholly owned subsidiary – Birmingham District Energy Company Limited as the delivery vehicle for the projects. 2006**
- **Broad Street scheme agreement signed on 6th December 2006**
- **Eastside scheme agreement for Aston signed 28th April 2008 & BCH 28th January 2009**
- **Each agreement for 25 years**

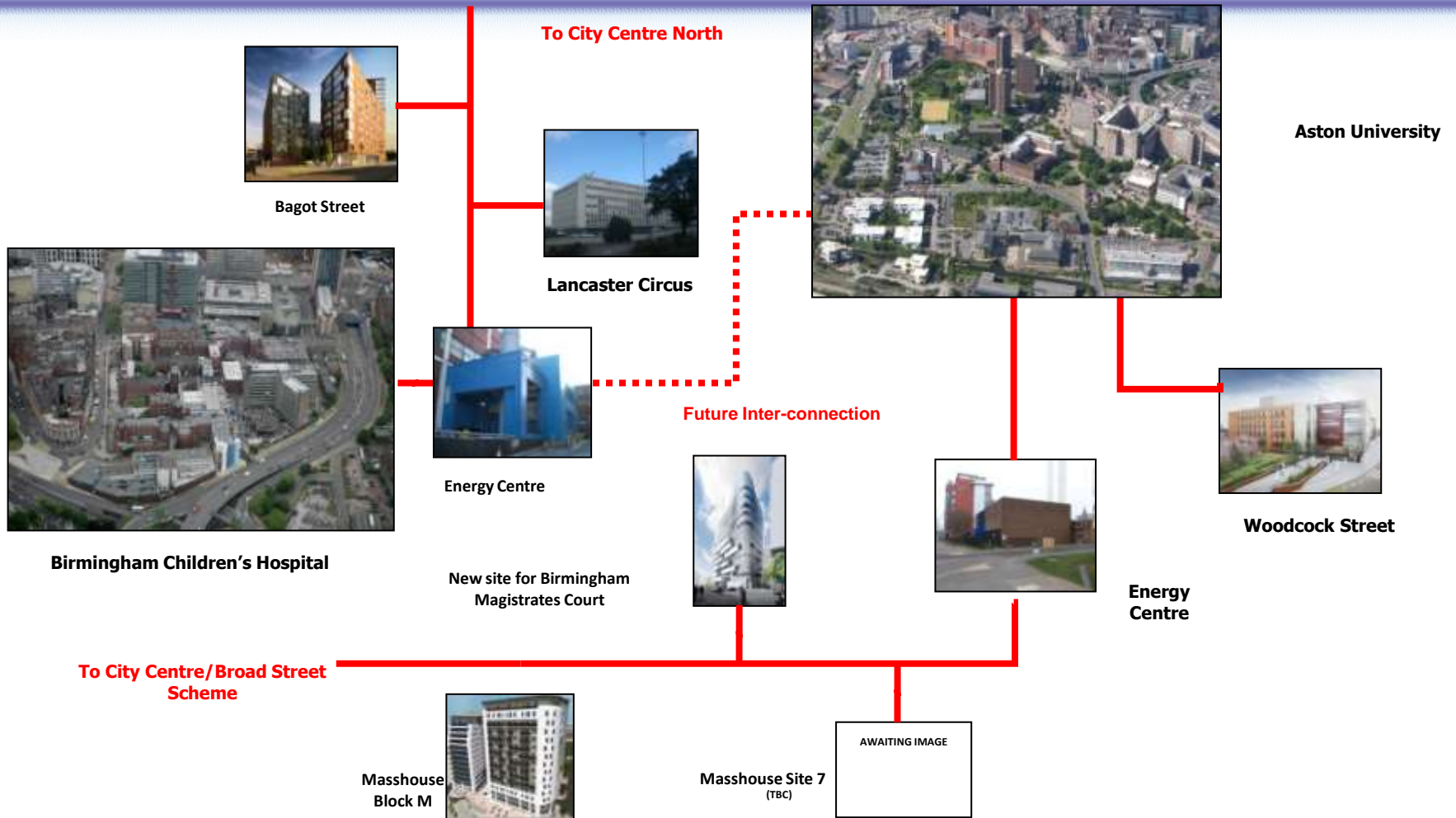
The Schemes

- **Three Schemes: - Broad Street, Aston University, Birmingham Childrens Hospital**
- **Each an independent CHP Scheme but will be connected to deliver CHP based District Energy across the whole of Birmingham City Centre**
- **Financial savings (developed on a whole life costing basis) maintained throughout the contract by indexing charges to national fuel prices, RPI etc...**
- **As scheme expands profits are shared with BCC – large number of potential connections; some already made, others in progress**
- **100% risk transfer to Utilicom**
- **6.6 MWe CHP (four energy centres – all to be thermally linked) - distributing energy via a network of buried pipework and cables**
- **£5 M of initial Energy Sales**
- **Emission reductions over 12,000 tonnes of CO₂ p.a.**
- **Capital cost ~ £7M, private sector investment from Utilicom & DEFRA CEP Grant**
- **First Scheme operational 1st October 2007**

Broad Street Low Carbon Network



Eastside Low Carbon Network



City Wide DE Scheme

12,000 tonnes CO₂ saved p.a.

3 Core Partners

Providing heat chilled water & electricity from

3 Energy Centres

6.1MWe_{CHP}

Birmingham District Energy
Company, Birmingham

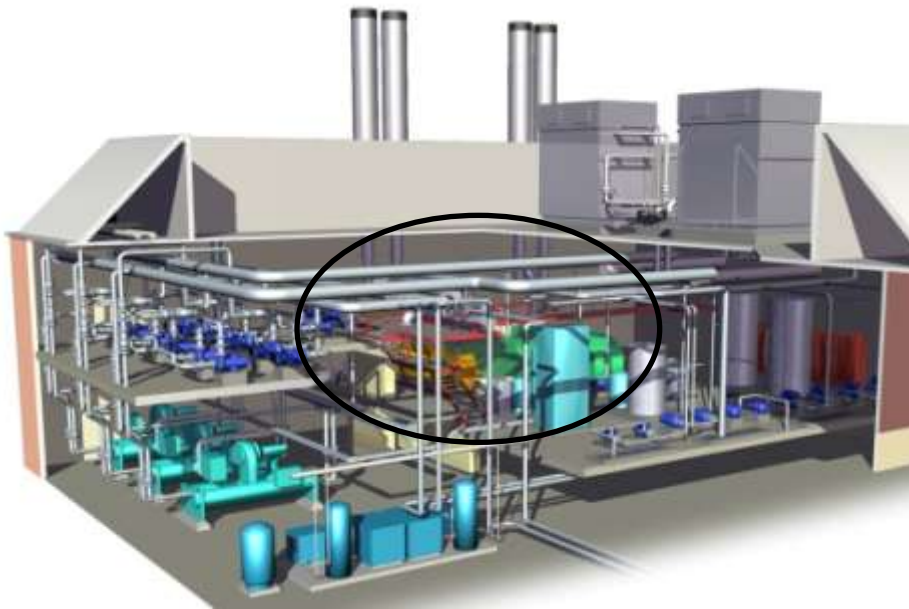


The Broad Street Scheme



Broad Street Scheme Energy Centre

COFELY
GDF SUEZ



Broad Street Scheme



Energy Centre

NIA

ICC

The R&P

Hyatt

**Paradise
Circus**

**Council
House**

**Town
Hall**

1. Phase 1 – Birmingham Children’s Hospital and BCC Lancaster Circus
 - CHP – 1.5 MW in new energy centre
 - Application made for £1M NHS Capital Grant
 - Energy Sales - £1.04M
 - Carbon Savings - 3,500 Tons of CO₂

2. Phase 2 – Aston University
 - CHP – 2 x 1.5 MW in existing boiler house
 - Energy Sales - £2M
 - Carbon Savings - 5,300 Tons of CO₂

Eastside Schemes



Regeneration Areas/ Potential Consumers

Energy Centre

BCC

BCH

Aston University

Energy Centre

Birmingham

Aston University



Birmingham Childrens Hospital



BCH New Energy Centre



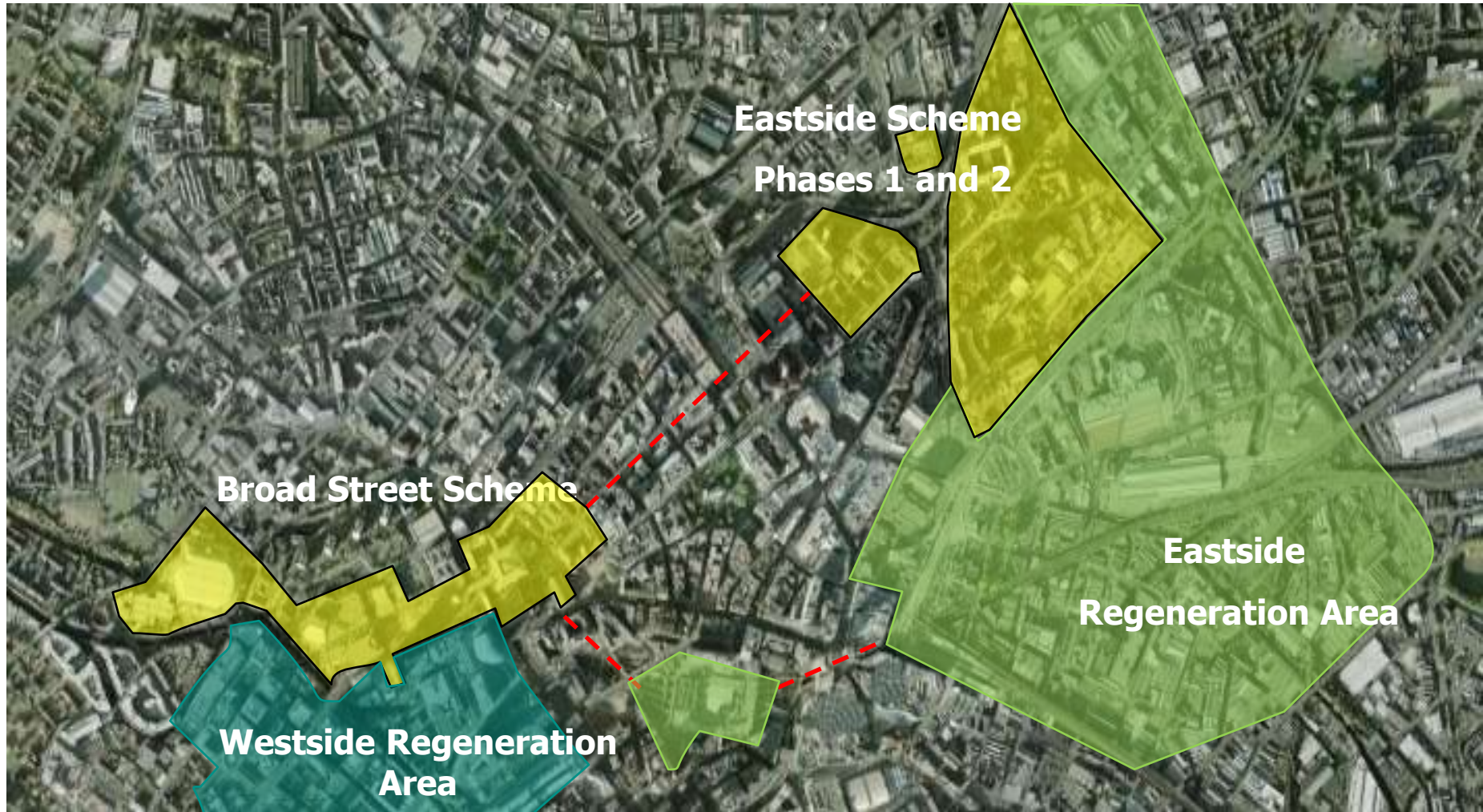
Current Potential Connections

Many potential connections being progressed including:

- Mass House
- City Park Gate
- New Library for Birmingham



The Combined Schemes

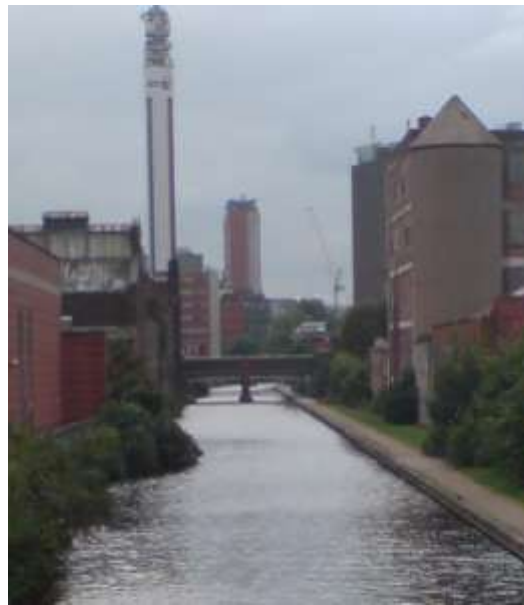


--- Potential future energy links

The Renewable Potential

- 1. Woodchip procurement : Arising from Birmingham City Council's arboriculture activities**
- 2. Anaerobic Digestion of Waste : Potential to source food waste through a number of streams including a local fruit market**

- Potential to utilise the City's Canal to transport the fuel to the Heat Station



The Future Vision

1. Expand both schemes to serve third party heating, cooling and electricity loads across their City area
2. Interconnect the two schemes
3. Introduce Biomass generation into the schemes – wood chip and digestion
4. Increase carbon savings from 12,000 to 20,000 Tons of CO₂ p.a.

Other Examples of Cofely's District Energy Schemes

New Building Housing - Greenwich Millennium Village

COFELY
GDF SUEZ

CHP Facilities Managed and Operated by
Utilicom for all existing phases – 660
dwellings

Working in partnership with GMV to
develop CHP facilities for full scheme –
3,000 dwellings



Urban Regeneration – Dwellings and Healthcare



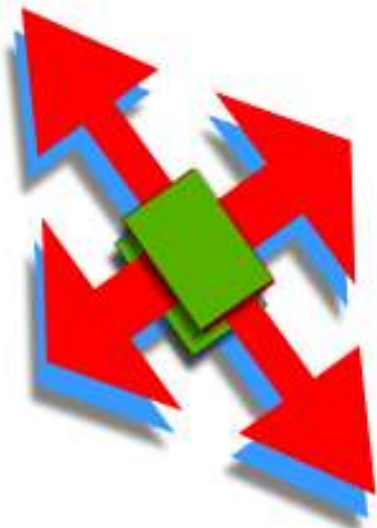
270 private and social dwellings
100 bed nursing home
180kW CHP with thermal store
Includes private wire to all consumers

Alex Park Estate and Proposed 1 MW Biomass Boiler



Eastleigh Council Offices and Leisure Centre





ukDEA.org.uk

The UK District Energy Association



- 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

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

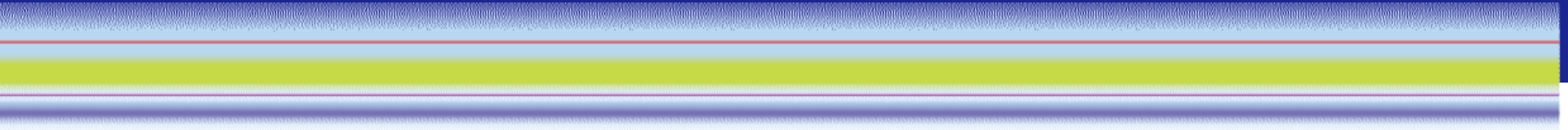
- Offer guidance to other organisations
- Raise awareness of district energy as a low carbon solution and the benefits that it can deliver
- **Joining the organisation will ensure your organisation gains the tools and support that you need to develop your scheme**

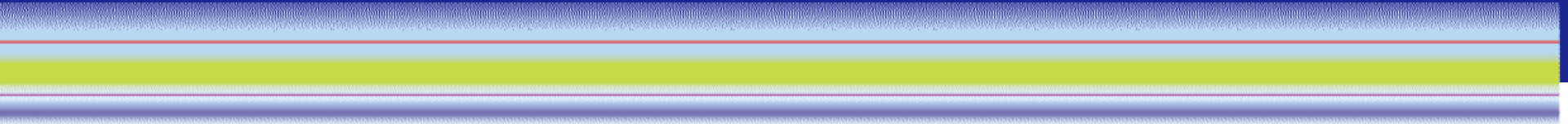


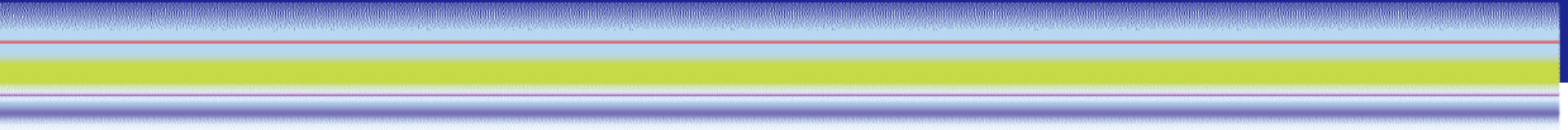
*"As a long time advocate of District Energy, I look forward to working with the ukDEA and their members to refine our approach" - **Greg Barker MP**
- Minister of State for Energy and Climate Change*

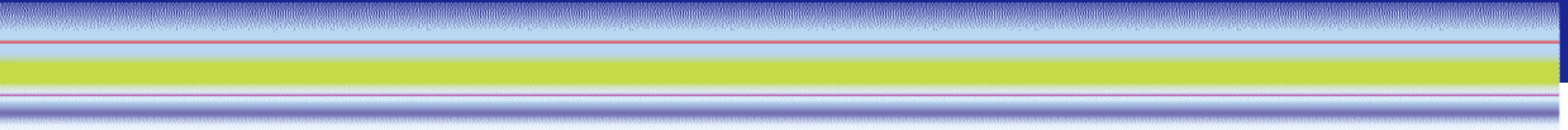
Contact

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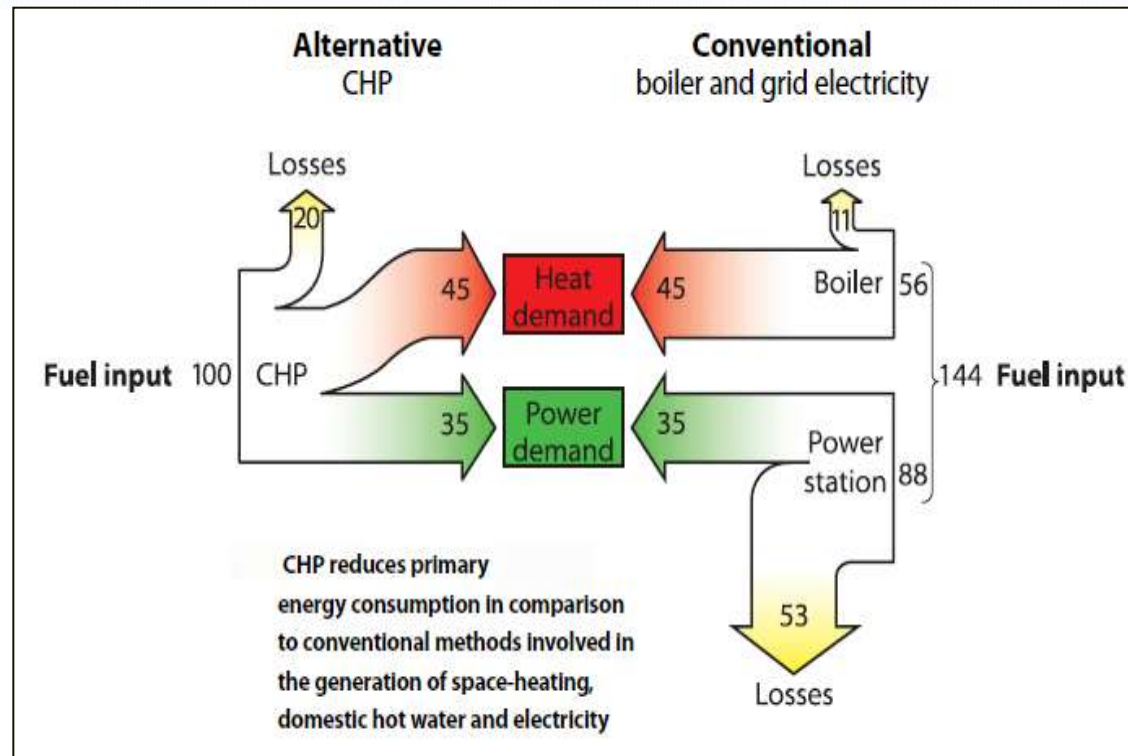


What is CHP and District Heating?

The use of heat produced when generating electricity, and which is usually wasted

Various fuels can be used

What is CHP?



Efficiencies

CHP - operates at 70-85% efficiency compared to typical power stations 25-35%.

CHP - Replacing central power stations with more efficient local generation

CHP

Operates at 70-85% efficiency compared to typical power stations 25-35%.

