

Net Zero Go



Local Authority Innovator Workshop: Developing Robust Strategic and Commercial Cases for Heat Network projects





Welcome

Gordon Graham, *Net Zero Go* – Strategic Engagement Manager, Energy Systems Catapult



UK Research
and Innovation



Department for
Energy Security
& Net Zero

ABOUT US.

MISSION: UNLEASHING INNOVATION AND OPEN NEW MARKETS TO CAPTURE THE CLEAN GROWTH OPPORTUNITY.

WHO?



**INNOVATION
EXPERTS**

WHAT?



**SUPPORTING
INNOVATORS TO
COMMERCIALISE**



**HELPING TO DESIGN
THE FUTURE ENERGY
SYSTEM TO UNLOCK
INNOVATION**



- Business Case Development / Validation
- Strategic Case and LAEP Planning
- Commercial Case & Business Model
- Project and Management Case

- Markets, Policy and Regulation Advice
- Digital and Data Guidance
- Whole & Local System Modelling
- Consumer Insights

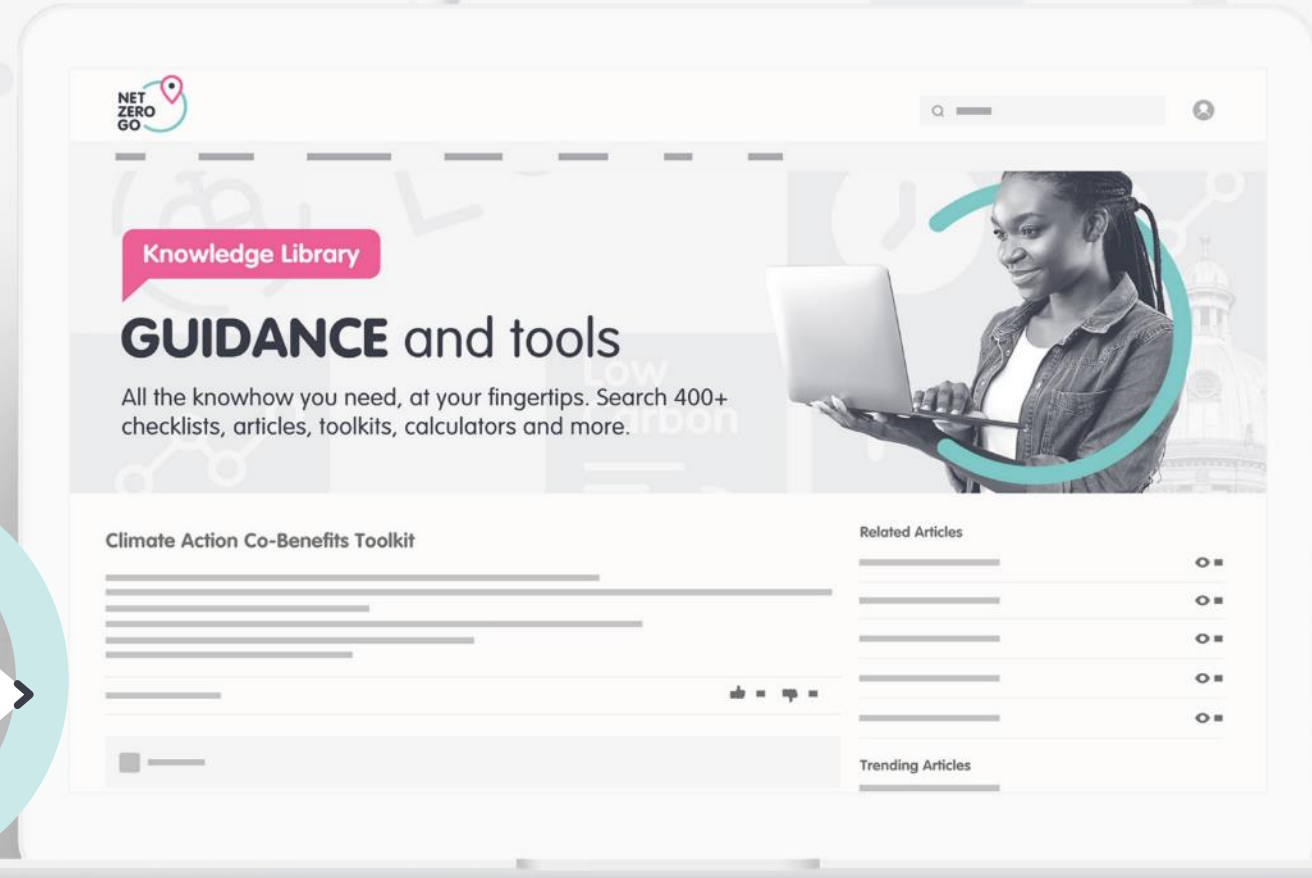
Platforms

- Decarbonising Local Places, Homes, Public Sector Estate, Campuses, Business Parks and Industrial Estates
- Integrating Transport, Buildings, Sites with Energy System
- Deliver Large Scale Innovation Trials

We work with
Innovate UK

Net Zero Go

A unique digital platform...
that brings together all net
zero transition knowledge,
tools, and expertise in
one place...
for the benefit of UK local
authorities and their
partners.



Purpose of today's session

- Disseminate knowledge, insight, and experience from across the industry with a key focus on developing the Strategic and Commercial Cases for heat network and heat pump project types.
- See how we can help councils take their heat decarbonisation feasibilities into development with financing, using our Net Zero Go guidance and templates.
- Gain a better understanding of how we can help local authorities to overcome their challenges in this area, and what heat resources they're exploring in Net Zero Go.

Agenda



Welcome and intro

Gordon Graham – Energy Systems Catapult 10:00 5 mins

Developing a business case – Net Zero Go guidance and templates

Laura Penny – Energy Systems Catapult 10:05 5 mins

Overview of Heat Network Zoning

Mark Woodward – Nordic Energy 10:10 10 mins

Local authority heat network case study – taking feasibility into implementation

George Munson – Leeds City Council 10:20 10 mins



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Department for
Energy Security
& Net Zero

Agenda

Local authority challenge on developing the business case for a heat network project

Jonathan Morris – Tower Hamlets London Borough Council

10:30 5 mins

Roundtable – responding to local authority challenge

Daniel Murrant – Energy Systems Catapult
Ben Shafran – Energy Systems Catapult
Bob Barnes – Nordic Energy
Steve Gummer – Sharpe Pritchard Solicitors
Sam Moore – South West Net Zero Hub

10:35 20 mins

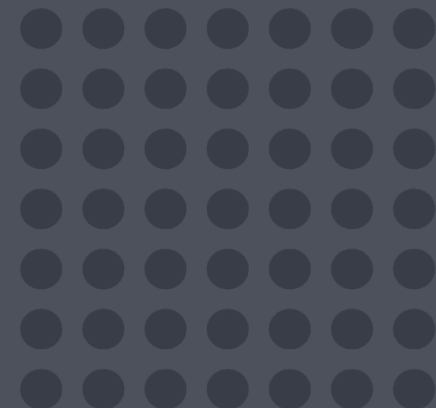
Final remarks

Gordon Graham – Energy Systems Catapult

10:55 5 mins

Developing a business case – Net Zero Go guidance and templates

**Laura Penny, Net Zero Go – Local Energy Insights Manager,
Energy Systems Catapult**



Overview of Heat Network Zoning

Mark Woodward, *Director*, Nordic Energy

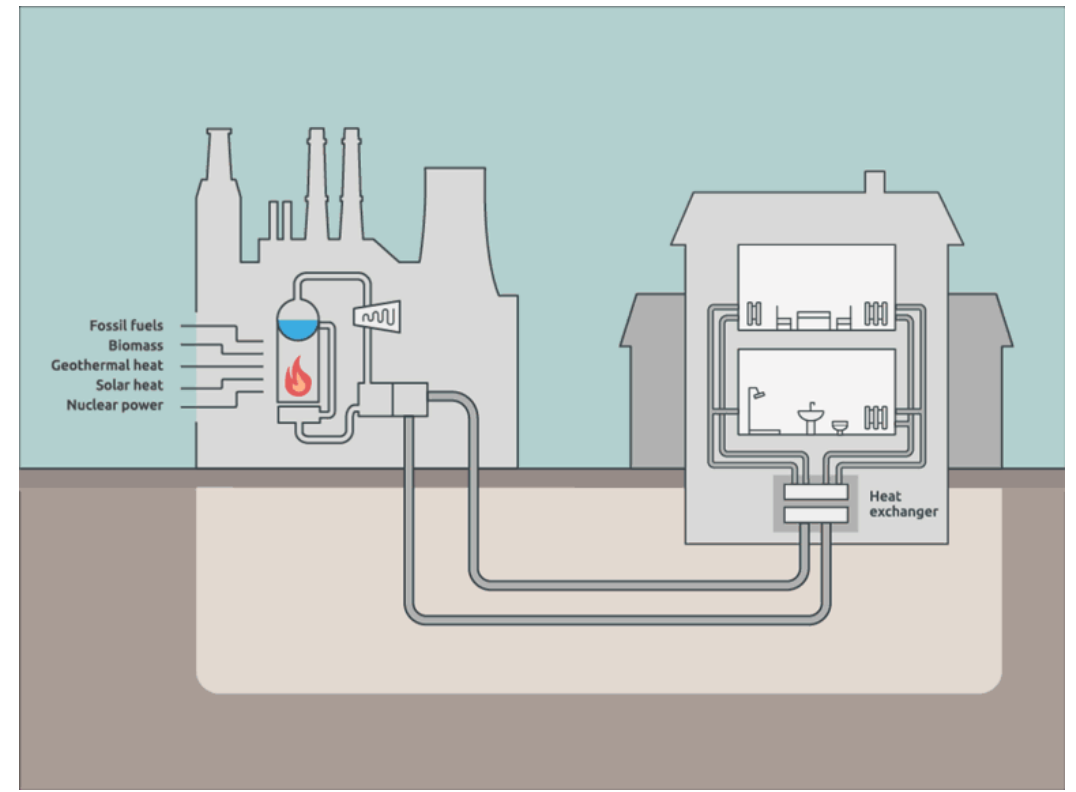
INTRODUCTION



Mark Woodward
Director – Nordic Energy

HEAT NETWORKS

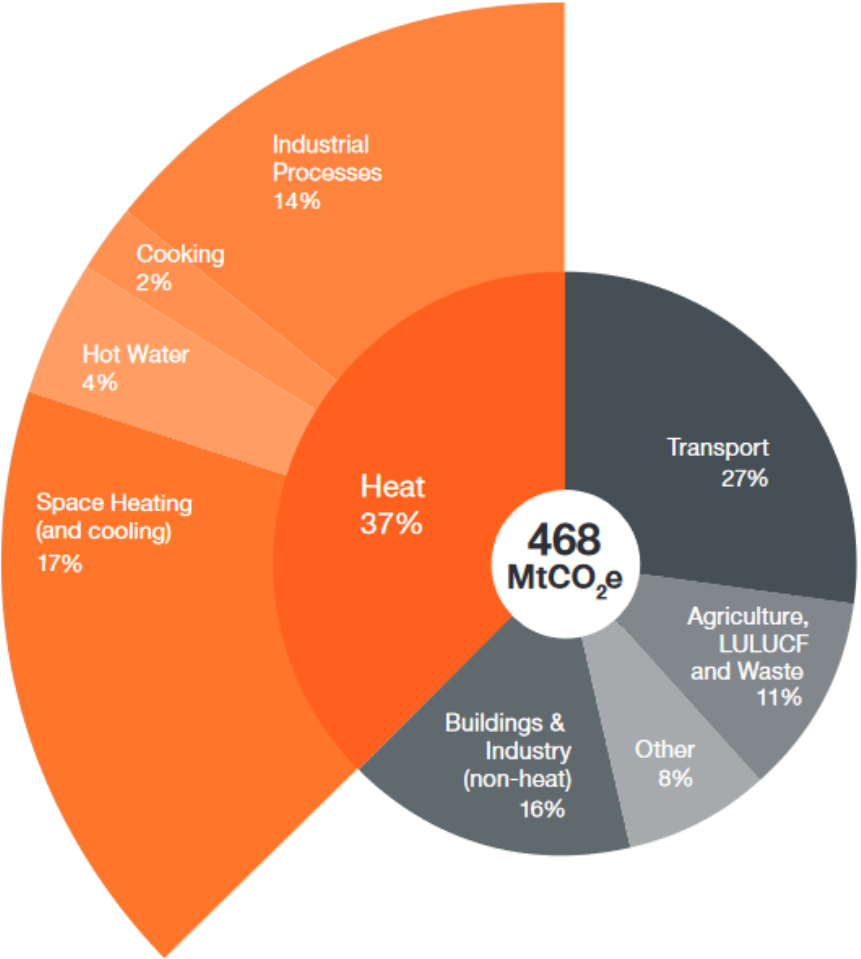
Heat networks (district heating) supply heating, from a central source or sources, via a network of underground pipes carrying hot water.



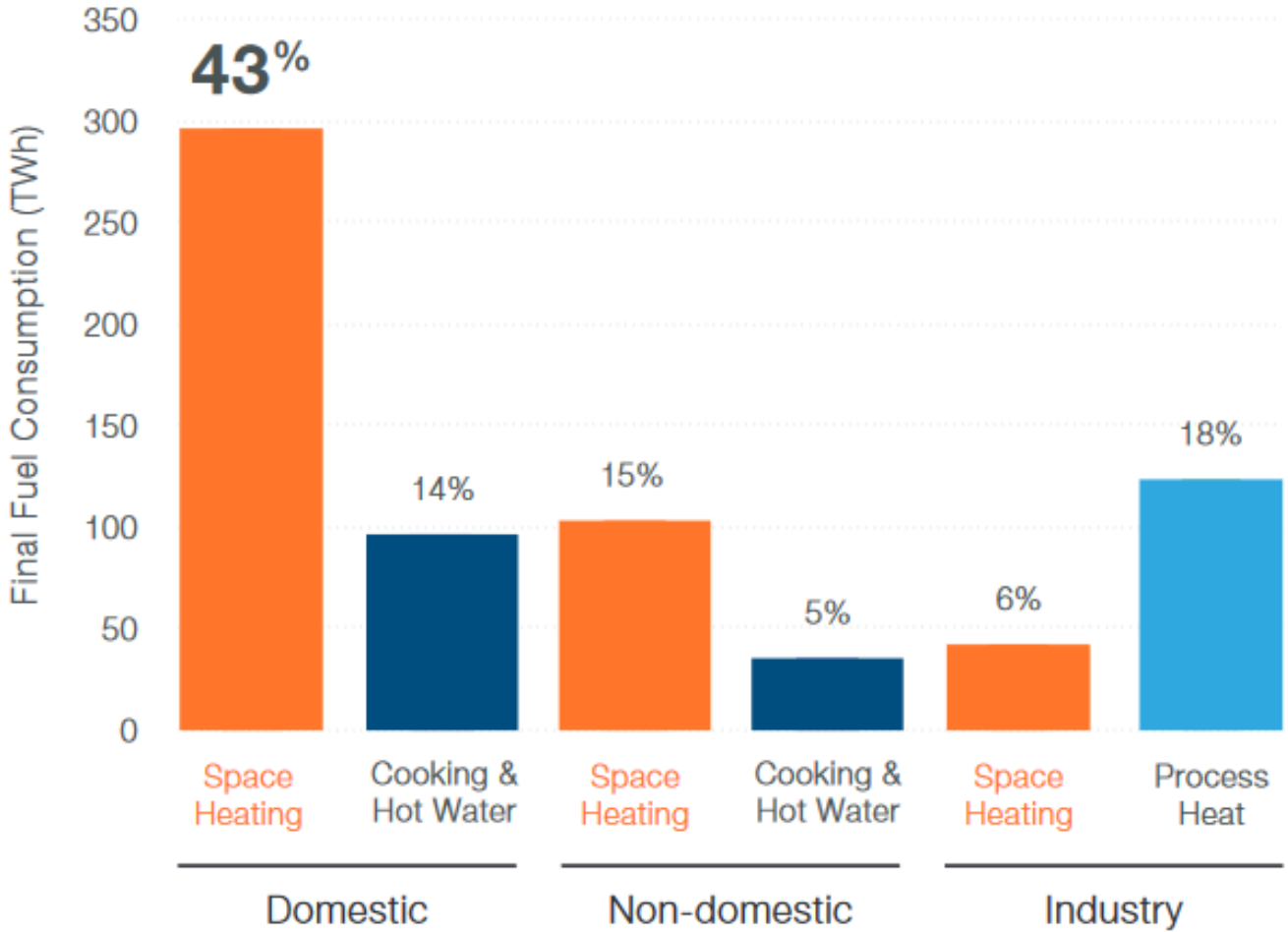
UK HEAT NETWORKS

	MARKET SHARE %	
CURRENT MARKET - 14,000 NETWORKS	2	(SWEDEN 55%)
TARGET BY 2050	18	

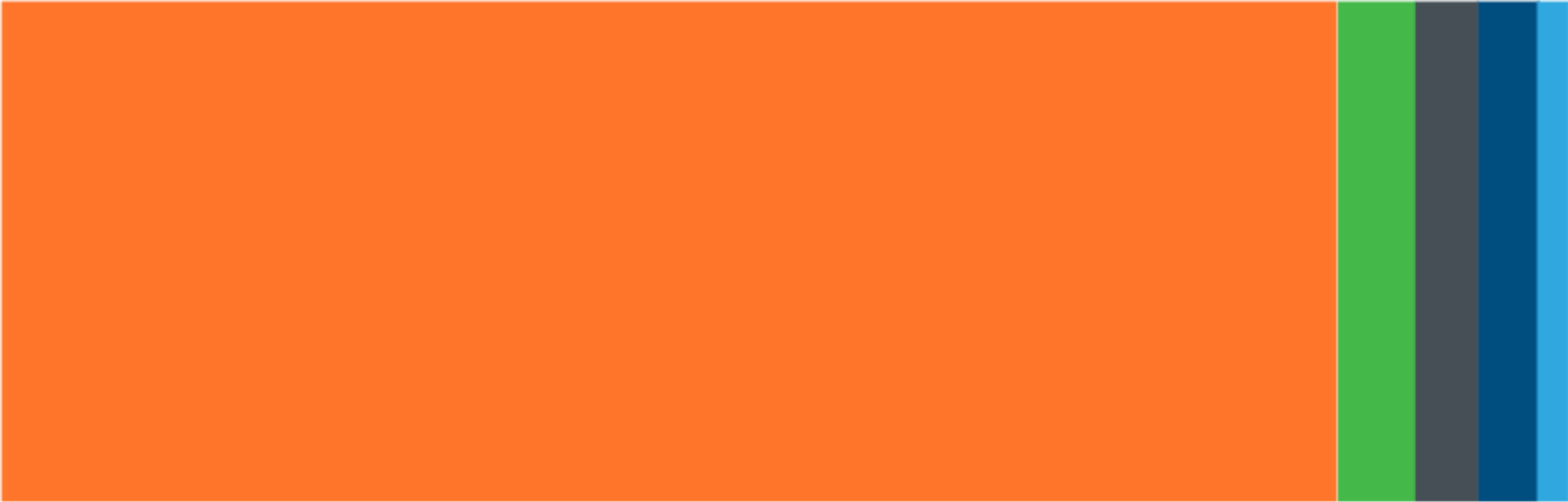
Estimated UK Emissions Attributable to Heating - 2016



Fuel
Consumption
for Heat - TWh
2017



Fuel
Systems
in
Homes
2016



Gas Central Heating

Electric Storage Heating

Oil Central Heating

Other

Heat Networks

85%

5%

4%

4%

2%

UK Government Policy

Energy Security Bill

Heat Networks and Zoning

Industrial Strategy

Clean Growth Strategy

Energy Security Bill - 2025

Heat Networks and Zoning	Decarbonisation of Industry
Hydrogen	Alternative Fuels
Nuclear inc. Fusion	Electricity Storage
Energy Efficiency	On-shore Electricity Networks
Off-shore and On-shore Wind	Smart Metering
Carbon Capture and Storage	CO2 Transport and Storage

<https://www.gov.uk/government/publications/energy-security-bill-factsheets>

WHAT ARE HEAT NETWORK ZONES

Heat Network Zones are areas in which it is assumed that most buildings will be connected to the Heat Network.

UK Government Policy

Heat Networks and Zoning

28 UK cities involved in the UK Heat Network Zoning Pilot Project

UK GOVERNMENT POLICY TARGET

“Our Proposals for Heat Network Zoning envisage Central and Local Government working together with Industry and Local Stakeholders, to identify and designate areas within which Heat Networks are the;

**“Lowest Cost, Low Carbon Solution for
Decarbonising Heat”**

Heat Network - Investment

£60-80 Billion – by 2050

THANK YOU



Mark Woodward
Director – Nordic Energy

Local authority heat network case study – feasibility into implementation

George Munson, *Senior Project Manager*, Leeds City Council

Leeds
Best City
Ambition

Securing a city led heat network

The Leeds PIPES heat network and the reasons for its success.

George Munson
Leeds City Council

Tackling Poverty and Inequality

Health and Wellbeing • Inclusive Growth • Zero Carbon

Contents

- What is Leeds PIPES?
- Why is it strategically important to Leeds?
- How did we develop and sell the business case to build it?
- Lessons learnt
- Future growth



Leeds PIPES stats



£60m+ investment.

EfW – 20MW low carbon heat source.

33MW of back up boilers for resilience.

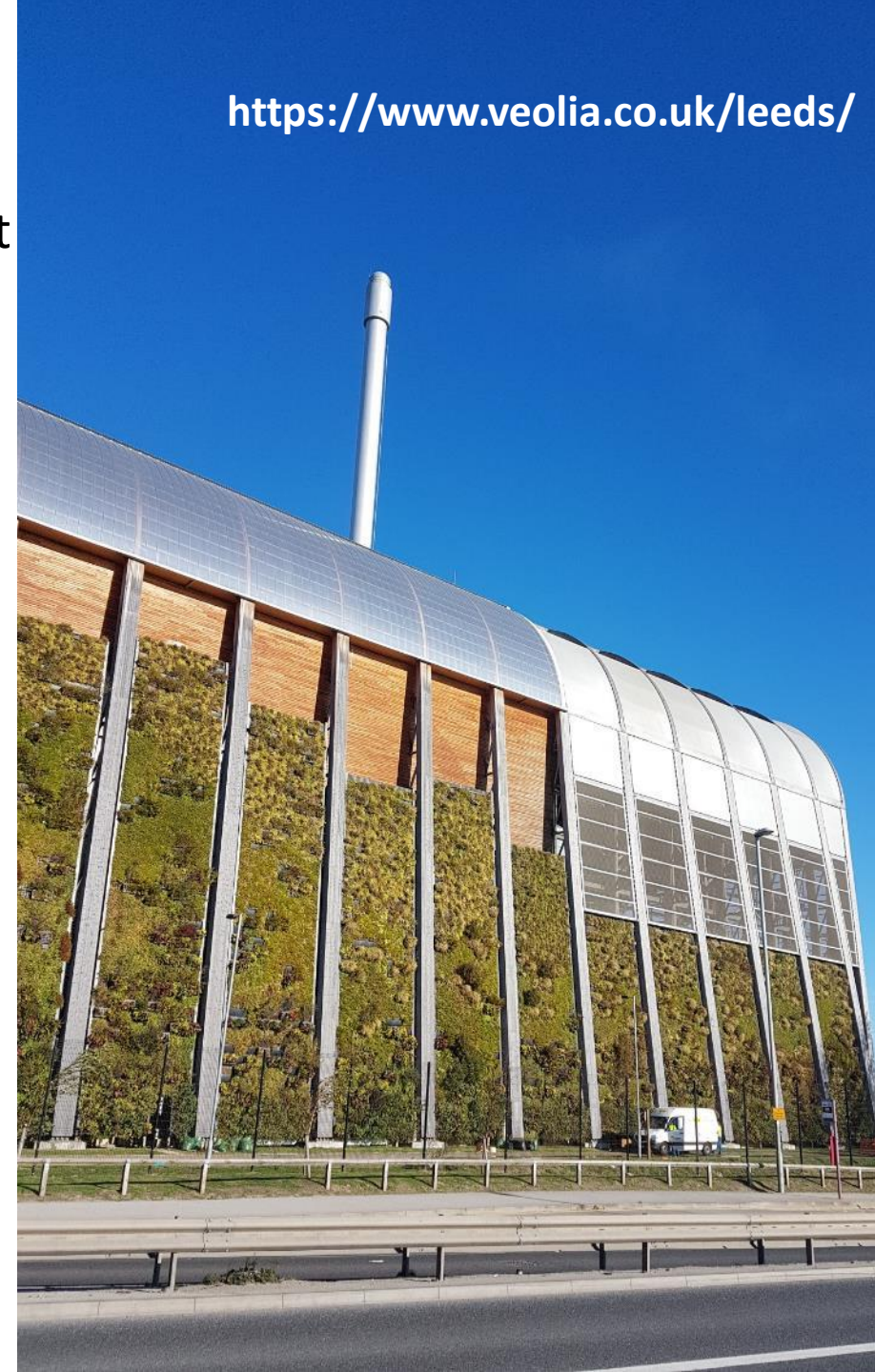
Underground pipework stretches over 13km.

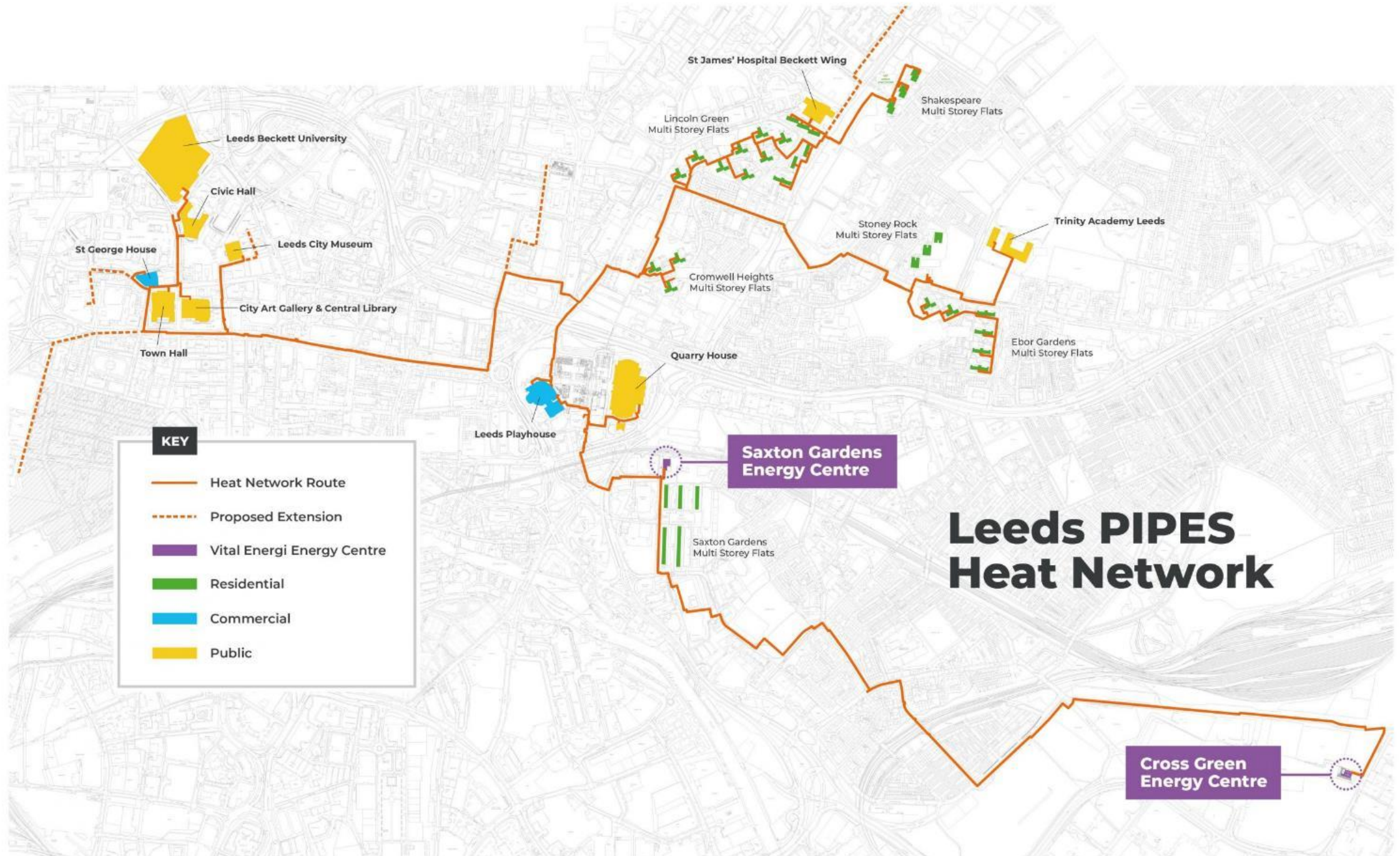
Significant growth opportunity – c160GWh of heat available.

Design life of c60 years.

Very low carbon, 0.03 kg CO₂/kWh.

<https://www.veolia.co.uk/leeds/>







Customers

- Healthcare
- Offices
- Education
- Government
- Housing
- Developers



Why did Leeds choose to develop DH?



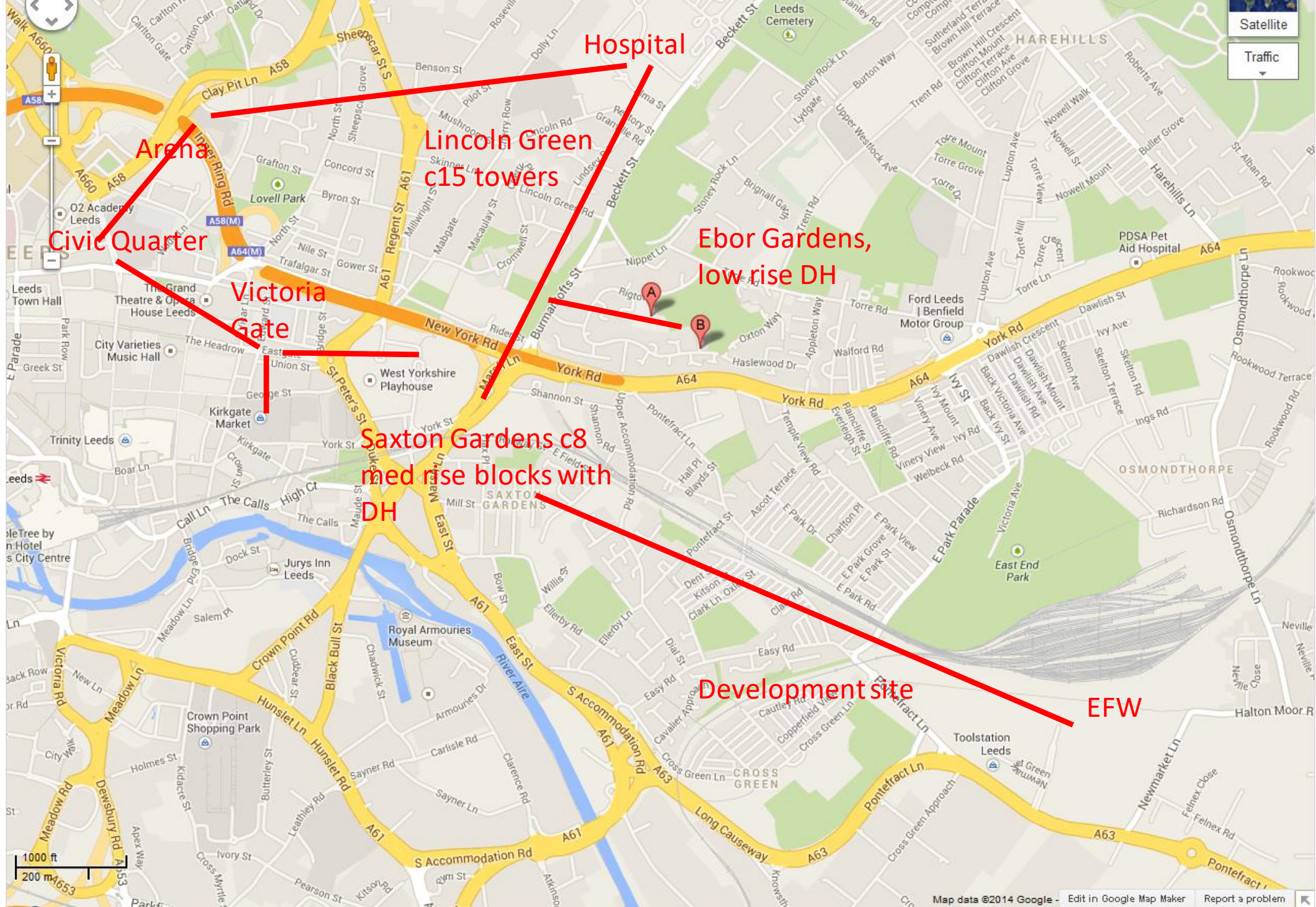
SENIOR BUY IN...

Political driver: using spare heat to keep vulnerable people warm

- Fuel poverty
- Economic growth
- Air quality
- CO₂ reductions
- Circular economy



THINKING BIG



Arena

Civic Quarter

Victoria Gate

Lincoln Green
c15 towers

Ebor Gardens,
low rise DH

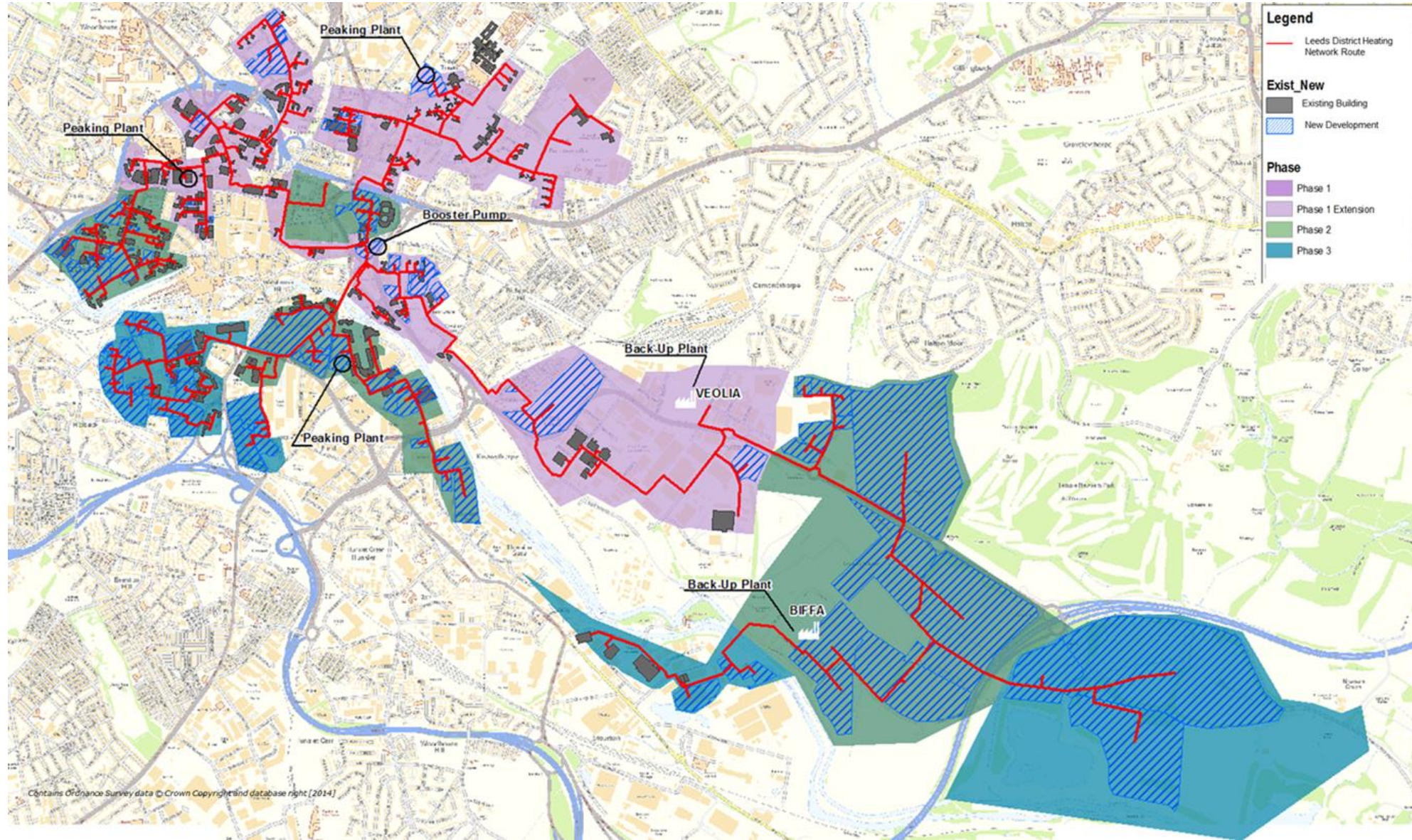
Saxton Gardens c8
med rise blocks with
DH

Development site

EFW

Hospital

Potential network...



And graft...

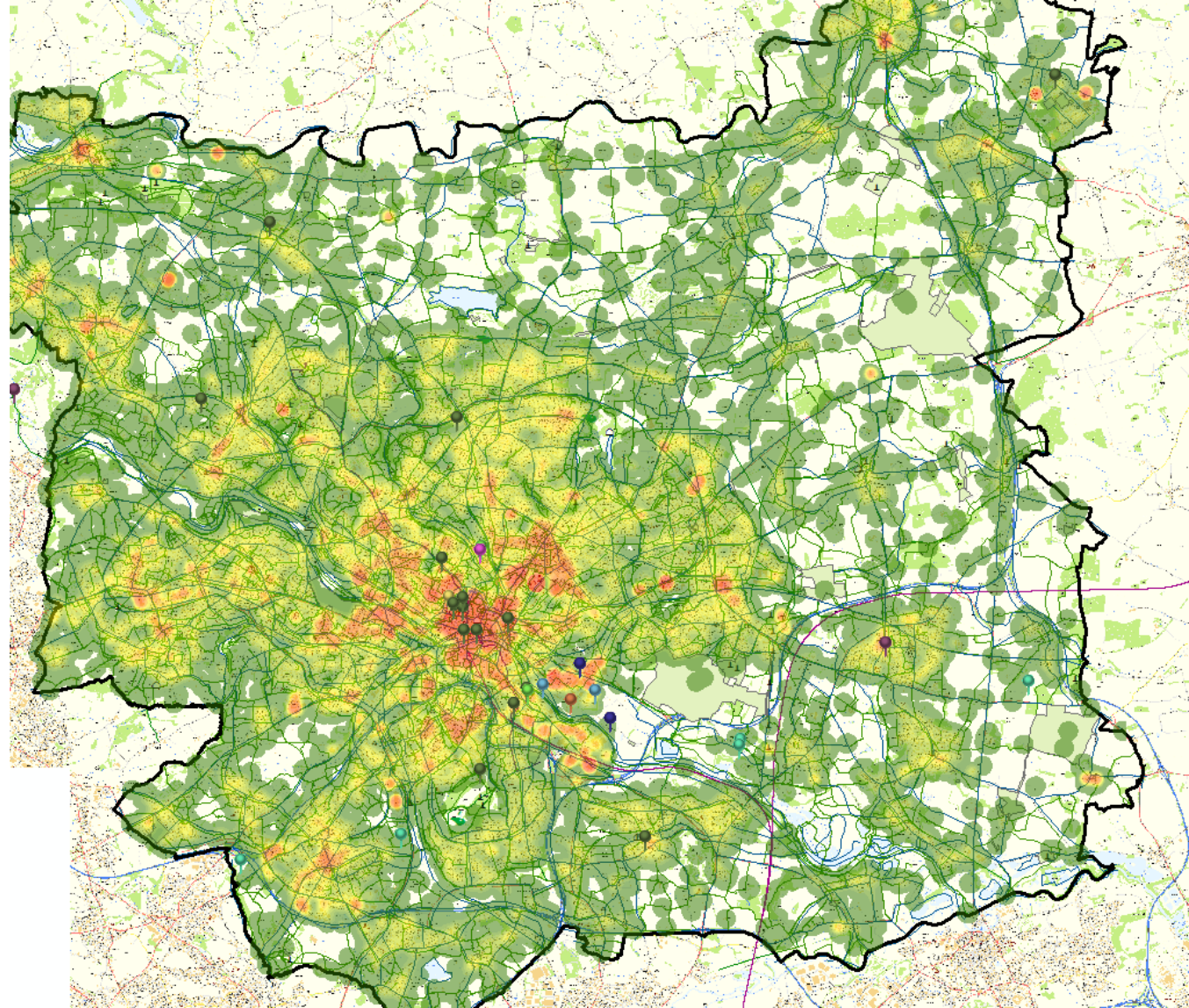
- Deed of Variation with Veolia
- ERDF, LGF & HNIP funding applications
- Planning Policy EN4 and Local Development Order
- Two 'Competitive with Negotiation' procurements
- Financial modelling
- Customer/developer engagement
- Internal engagement...

Where technically viable, appropriate for the development, and in areas with sufficient existing or potential heat density, developments of 1,000 sqm or more or 10 dwellings or more (including conversions where feasible) should propose heating systems according to the following hierarchy:

- (i) Connection to existing District heating networks,
- (ii) Construction of a site wide District heating network served by a new low carbon heat source,
- (iii) Collaboration with neighbouring development sites or existing heat loads/sources to develop a viable shared District heating network,
- (iv) In areas where District heating is currently not viable, but there is potential for future District heating networks, all development proposals will need to demonstrate how sites have been designed to allow for connection to a future District heating network.

Carbon savings and renewable energy generation achieved under this policy will contribute to EN1(i) and EN1(ii).

POLICY EN4: DISTRICT HEATING



Decisions

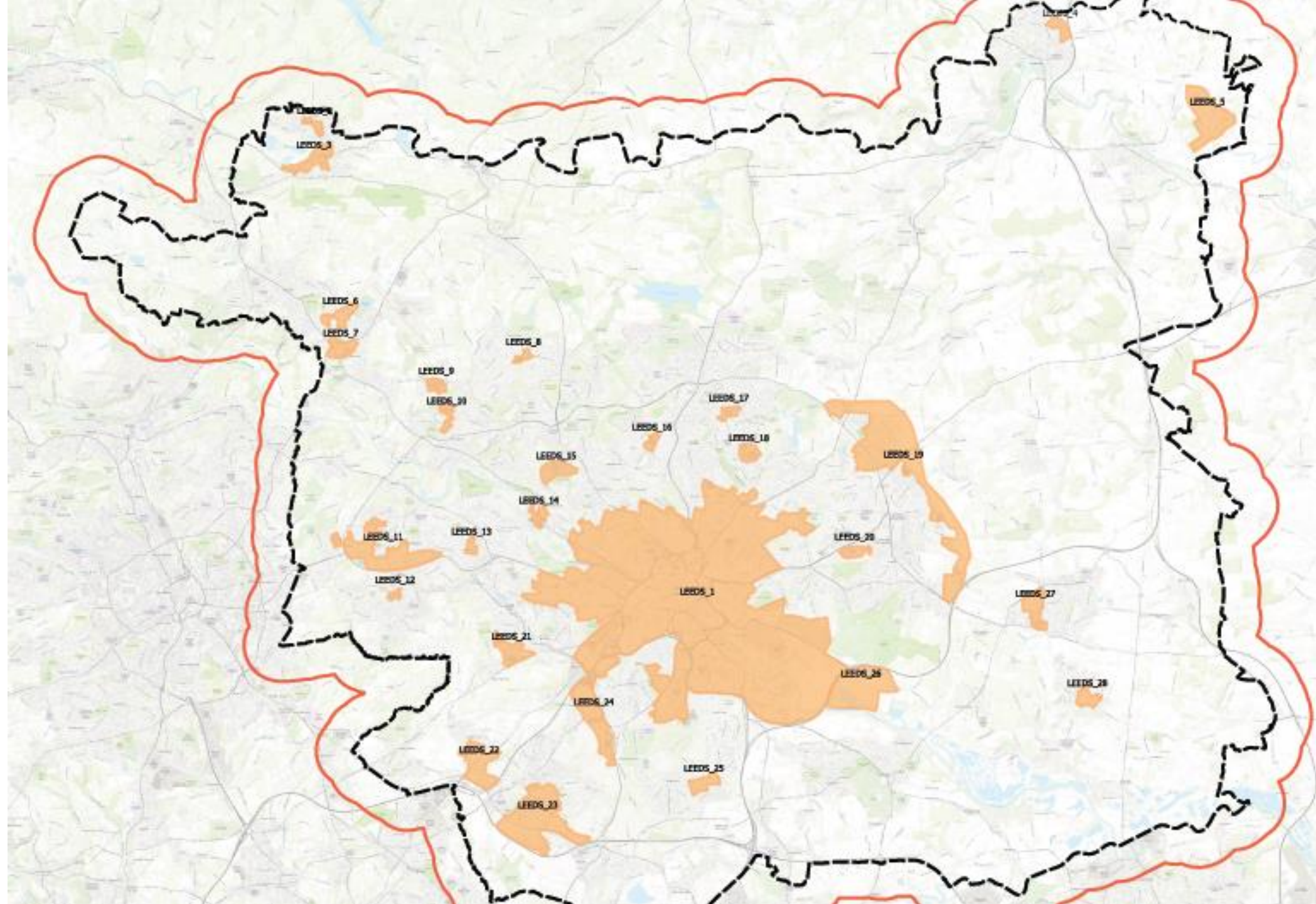
- We don't know enough to procure the right ESCO
- Better to retain DHN in council ownership
- Secure grants + PWLB to lower cost of capital
- Use existing LA powers to sell heat
- Secure a long-term DBOM contractor as partner
- Use Competitive with Negotiation Procedure
- Employ PM and Supervisor to support us during construction phase

Lessons Learned?!

- DH supports a council's strategic aims
 - Healthier homes
 - Economic growth
 - Air quality, waste and CO₂ improvements
- Council **can** lead DH but benefits from a strong partner
- Procurement is key
- Essential to have a long term O&M contract to create incentive to optimise
- Possibly even better to procure an investing partner so they are financially incentivised to optimise
- Delivery creates a positive political story
- We have built and they are coming!

Future Growth

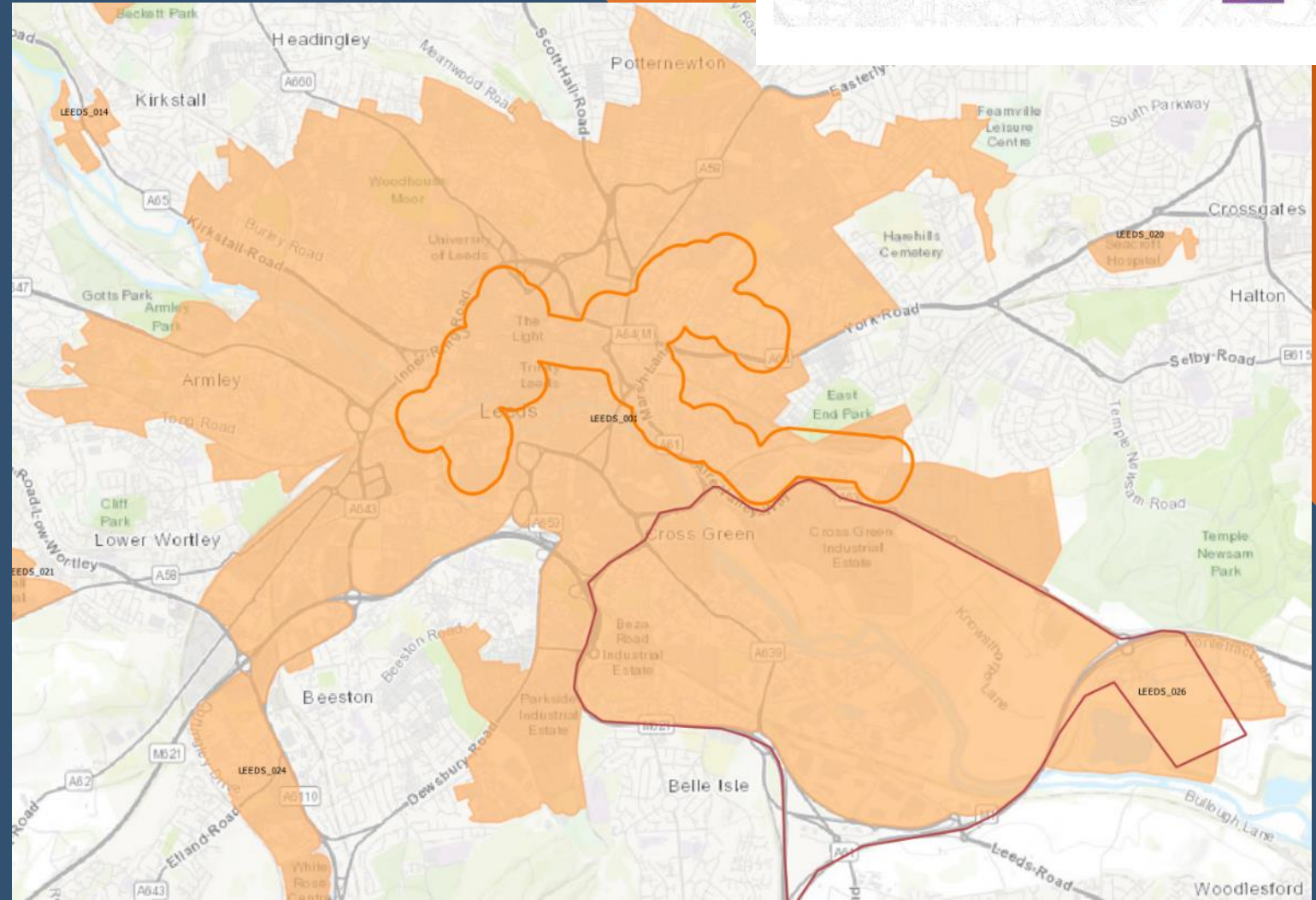
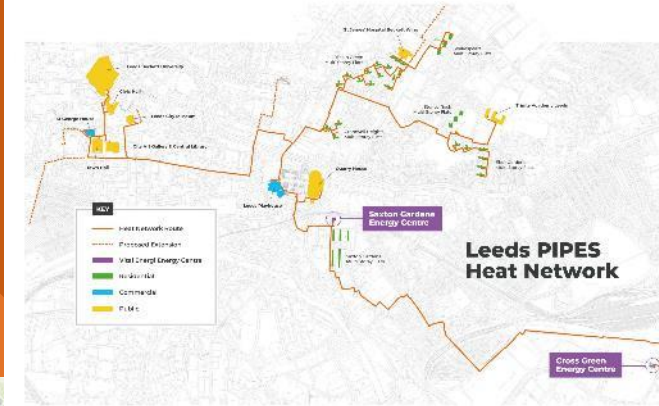




LEEDS ZONAL LANDSCAPE

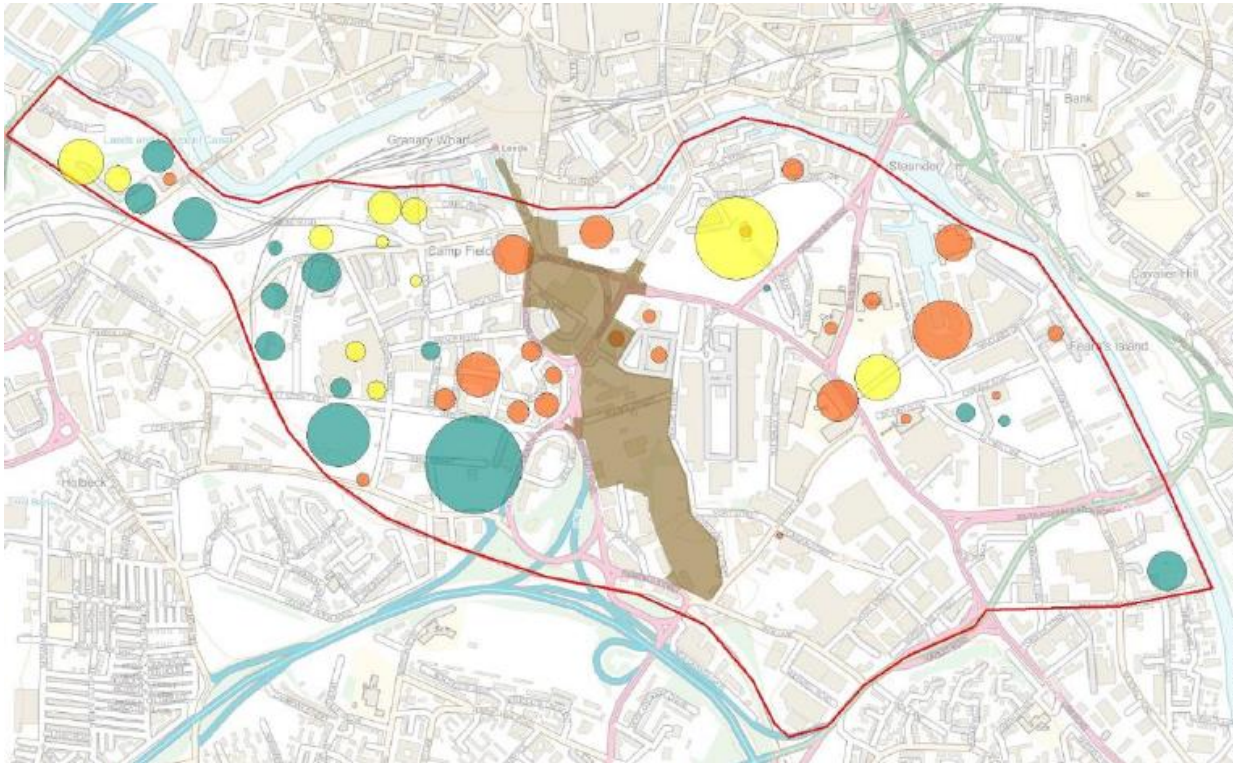
Leeds CC

- Focus: City Centre & Aire Valley Zones
- Existing Leeds PIPES network zonal expansion
- Planned new Skelton Grange EfW and network (SSE project developer – sizing and ability to extend)
- Additional Areas of interest for LCC:
 - Other zones that show potential for zoning e.g. those with high demand density, or viable heat sources opportunities
- Network mapping with zonal mandated buildings exercise being carried out
- Zonal network routing being carried out as part of Advanced Zoning Delivery Programme



Future plans and strategic growth – strategic extensions

- South Bank feasibility work
 - HNDU funding > GHNF funding
 - East and West clusters of demand
 - Glass factory heat source



George Munson

Senior Project Manager
Leeds City Council

07891 270294

george.munson@leeds.gov.uk

Local authority challenge on developing the business case for a heat network project

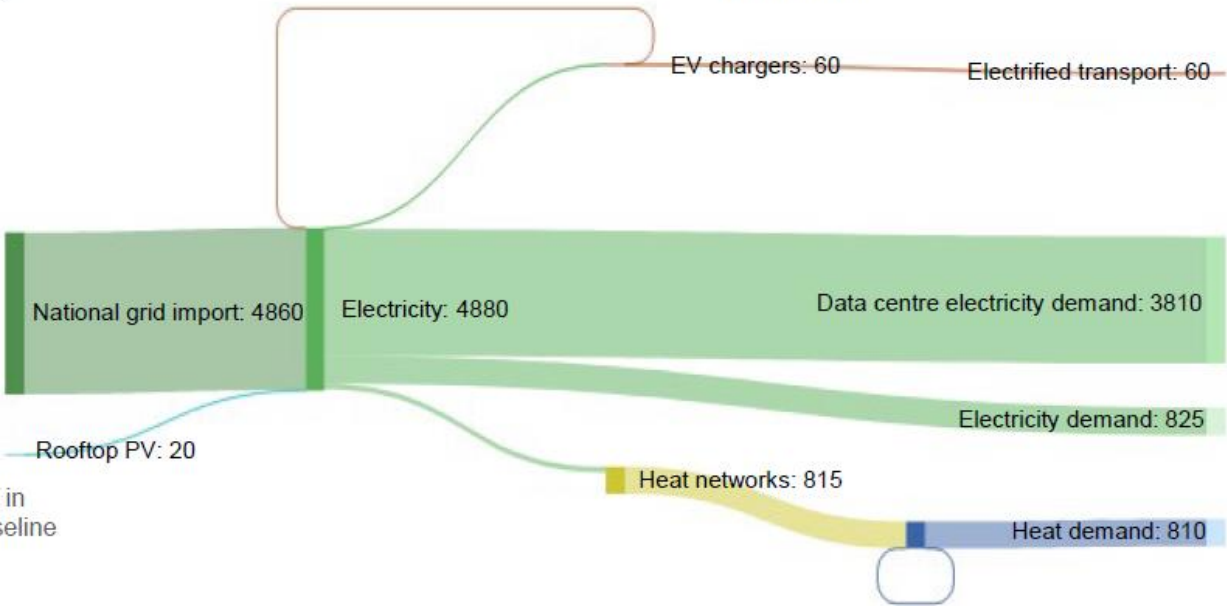
Jonathan Morris, *Growth & Infrastructure Manager,*
Tower Hamlets London Borough Council

London Borough of Tower Hamlets

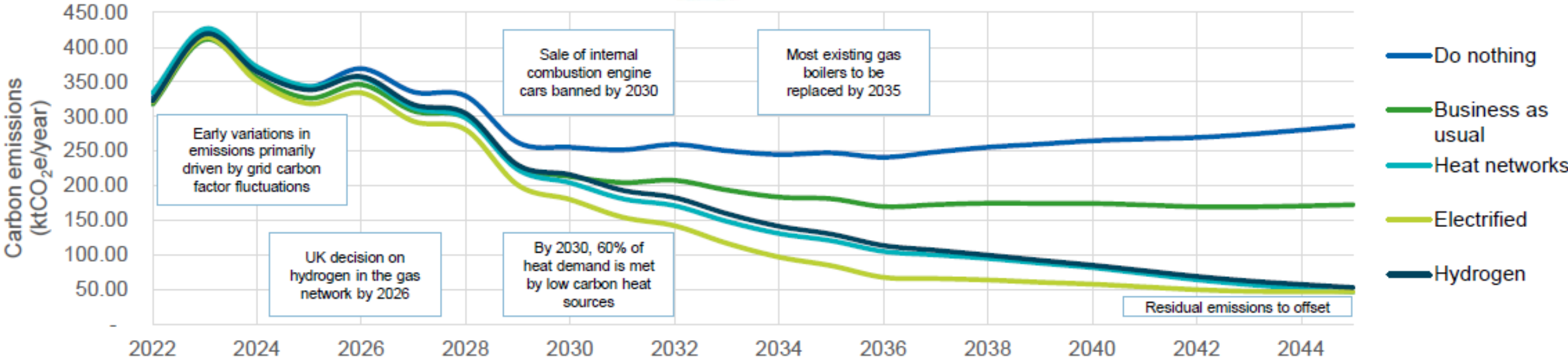
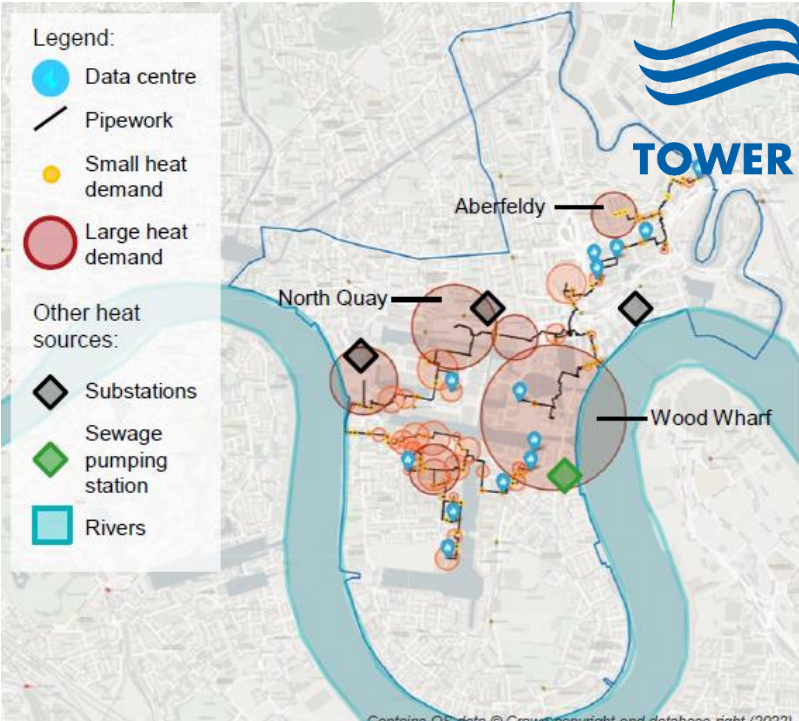


Majority of electricity imported from grid

3x electricity system compared to baseline
~ 3000GWh/year of total energy demand increase from baseline

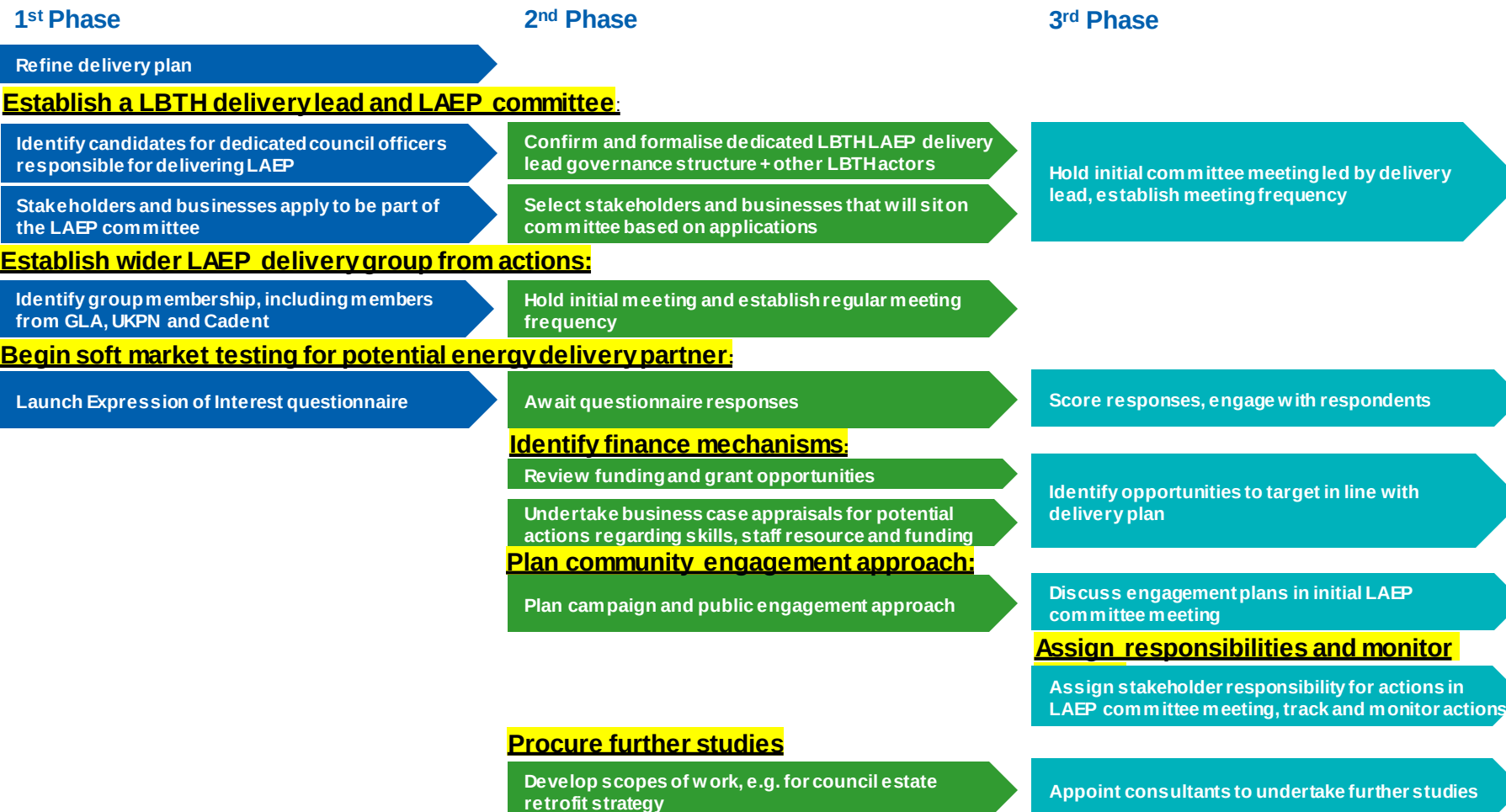


Significant increase in rooftop PV from baseline



4. Recommended action plan

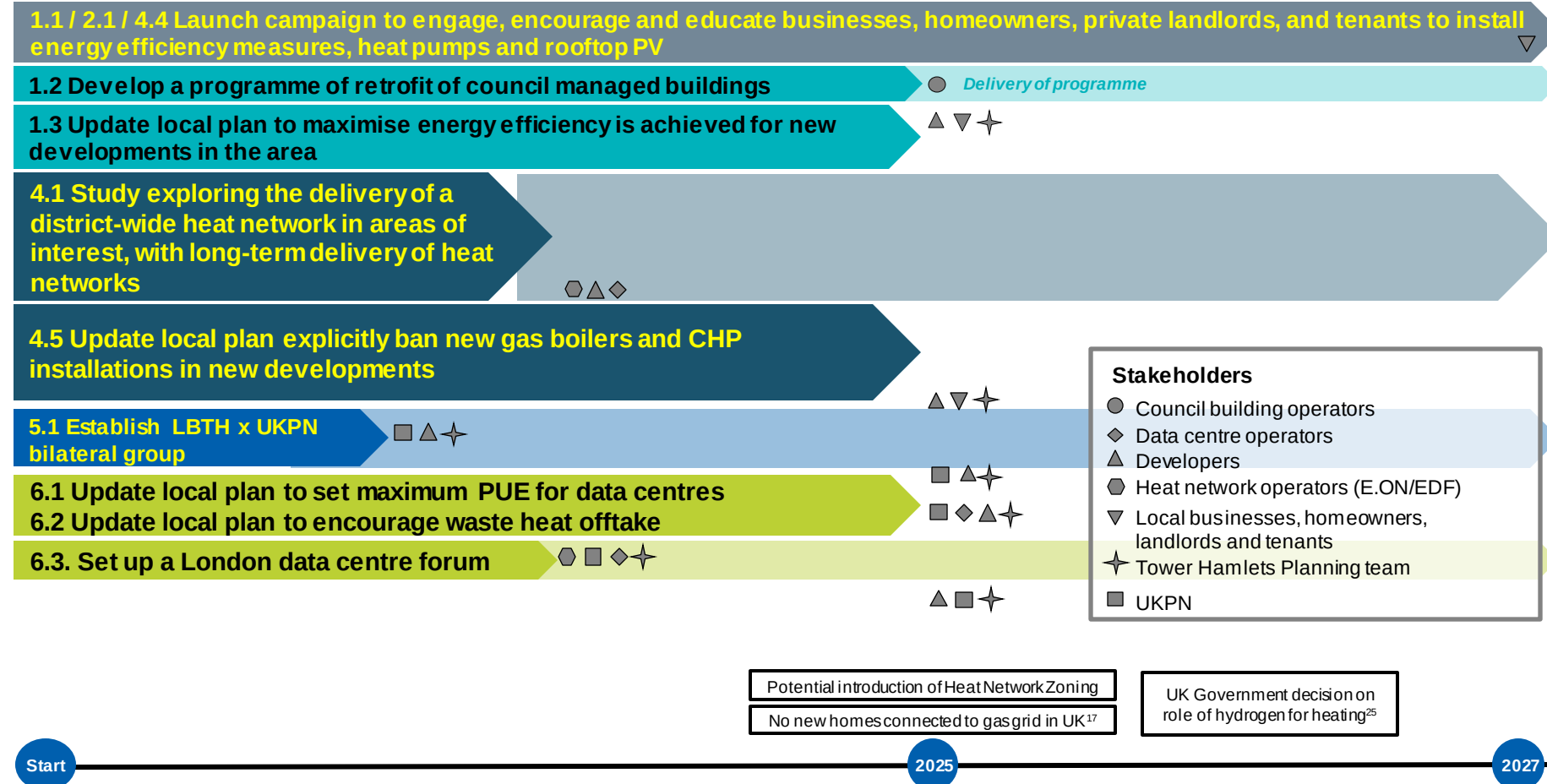
Initial phases of implementation



4. Recommended action plan

Medium term routemap

Medium-term routemap:



Roundtable

Daniel Murrant, Networks & Energy Storage Lead, **Energy Systems Catapult**

Ben Shafran, Head of Markets, Policy & Regulation, **Energy Systems Catapult**

Bob Barnes, Director, **Nordic Energy**

Steve Gummer, *Partner*, **Sharpe Pritchard Solicitors**

Sam Moore, Project Manager, **South West Net Zero Hub**

Closing Remarks

**Gordon Graham, *Net Zero Go* – Strategic Engagement Manager,
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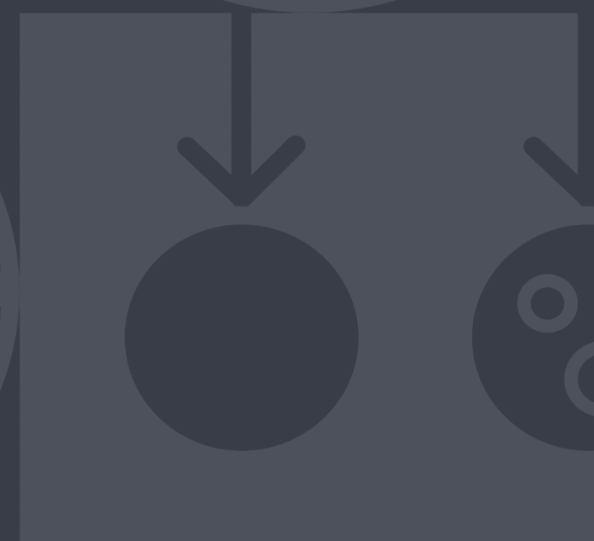
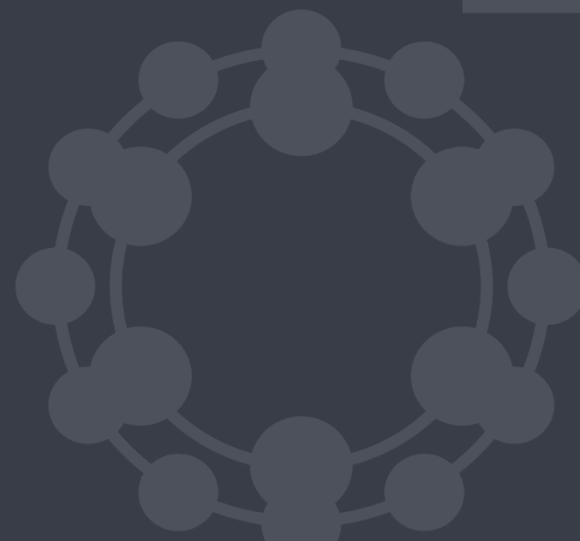
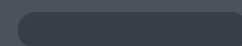
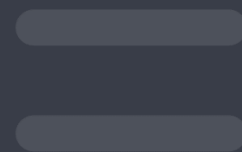
Find out more

- Get in touch with Net Zero Go team using enquiries@netzerogo.org.uk
- Post-event resources will be available to registered users in the Community Forums
- **To register for Net Zero Go** visit <https://www.netzerogo.org.uk/s/express-sign-up-page>
- **To follow us** for events and announcements <https://www.linkedin.com/company/net-zero-go/>

Thank you for joining us and we look forward to seeing you on Net Zero Go and sharing more with you in the future



CO₂



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Net Zero Go



Local Authority Innovator Workshop: Developing Robust Strategic and Commercial Cases for Heat Pump projects



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and Innovation



Part of

CATAPULT
Energy Systems



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Manager, Energy Systems Catapult**



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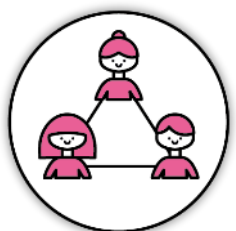
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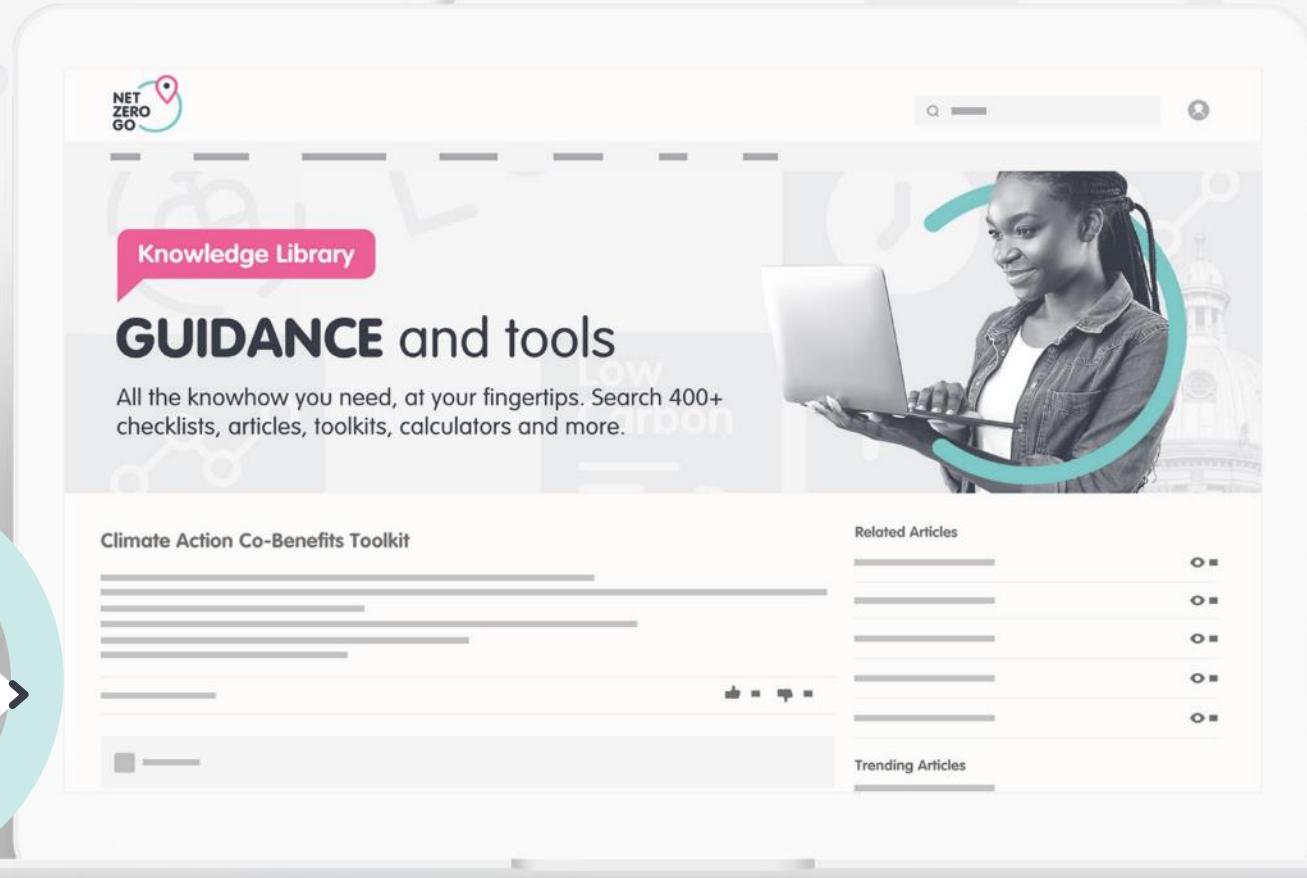
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Agenda

Welcome and intro

Gordon Graham – Energy Systems Catapult 11:00 5 mins

Developing a business case – Net Zero Go guidance and templates

Laura Penny – Energy Systems Catapult 11:05 5 mins

Heat pump landscape overview

Bean Beanland – Heat Pump Federation 11:10 10 mins

Local authority heat pump case study – taking feasibility into implementation

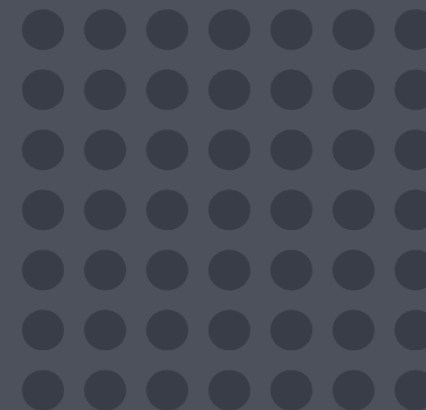
Sheryl French – Cambridgeshire County Council 11:20 10 mins

Agenda

Local authority challenge on developing the business case for a heat pump project	Alex Pearson – Midlands Net Zero Hub on behalf of Wychavon District Council	11:30	5 mins
Roundtable – responding to local authority challenge	Miles Messenger – Bouygues E&S Solutions Sheryl French – Cambridgeshire Council George Day – Energy Systems Catapult Christopher Holland – LASER Energy Steve Gummer – Sharpe Pritchard Solicitors	11:35	20 mins
Final remarks	Gordon Graham – Energy Systems Catapult	11:55	5 mins

Developing a business case – Net Zero Go guidance and templates

**Laura Penny, Net Zero Go – Local Energy Insights Manager,
Energy Systems Catapult**



Heat pump landscape overview

Bean Beanland, *Director for Growth & External Affairs,*
Heat Pump Federation

Local authority heat pump case study – feasibility into implementation

Sheryl French, Assistant Director, Climate Change and Energy Services, Cambridgeshire County Council

SWAFFHAM PRIOR HEAT NETWORK

WHOLE VILLAGE RETROFIT FOR HEATING AND HOT WATER

RURAL RENEWABLE HEAT NETWORK

18th May 2023



ENERGIES & SERVICES DIVISION OF



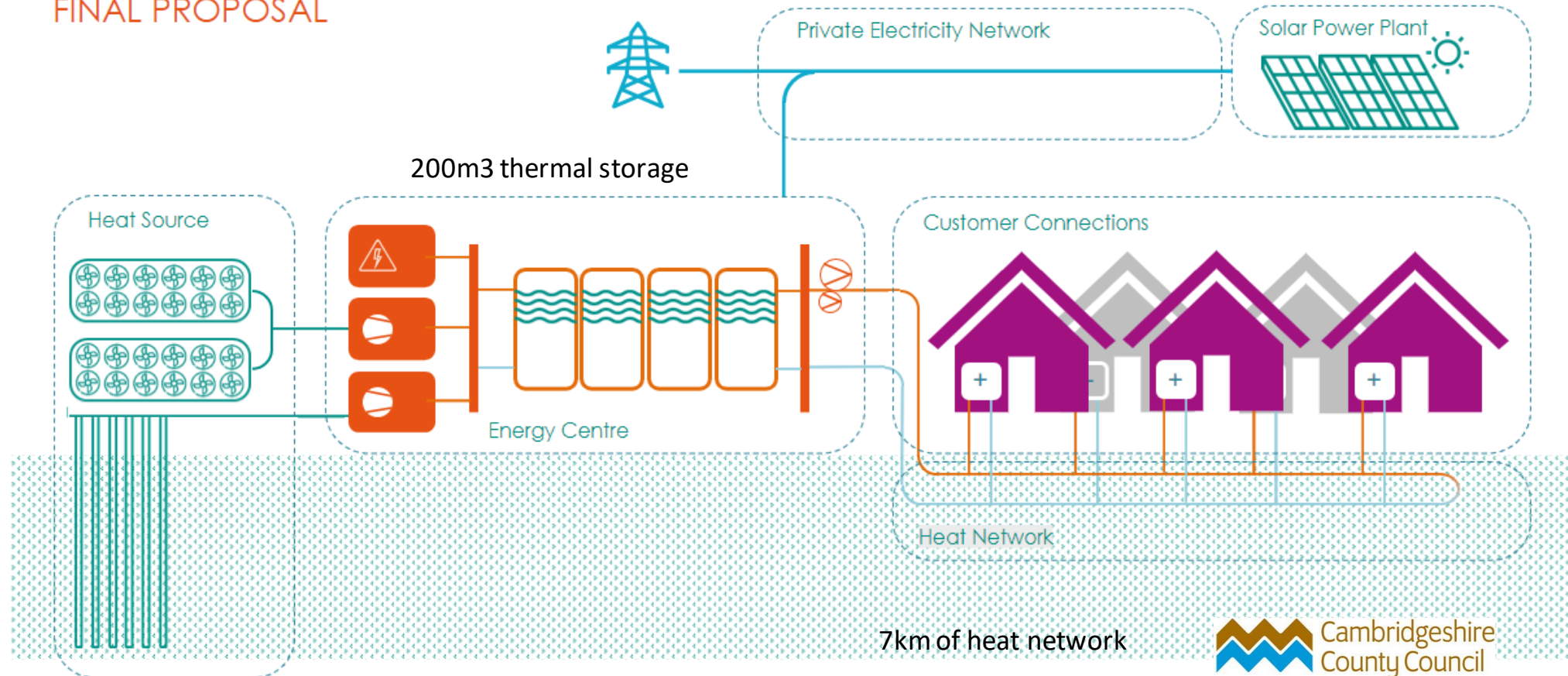
About Swaffham Prior



Schematic of the Project:

500Kw High Temp ASHP
2x 750Kw High temp GSHP

FINAL PROPOSAL



Map of the heat network and Energy Centre Location









Energy Centre and Primary
Heat Network
Constructed
during
2021/22

Yes. We experienced
steel shortages, demand
for borehole rigs and residents
Concerns digging up roads!





Homes are
connecting

.

Heat On
2023

Key Challenges

Data

Defining the thermal energy demand profile of the village

- 330 dwellings, a pub, a school
- A handful of oil invoices, no metered data...

Technology

Engineering & Design

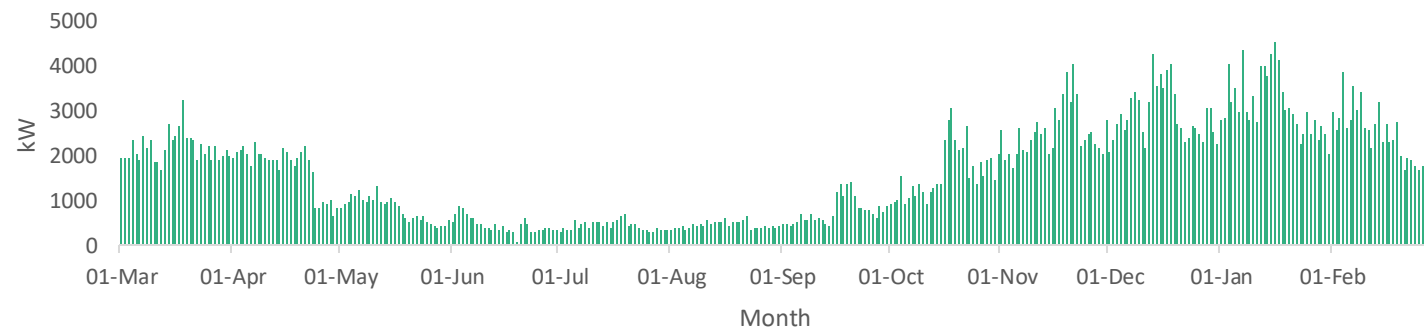
- Installed heat meters in a sample cross-section of dwellings
- Remote data streaming to BYES energy data analysis software

Regulations

- Energy Demand Research Project (EDRP) data
- Hourly gas consumption data for 16,000+
- Building archetypes > monte-carlo simulation > linear regression model

Stakeholders

Programme



Key Challenges

Data

Technology

Engineering & Design

Compatibility with 330 end-customer heating systems?

- Existing system flow temperatures ranged from ?? to 85DegC
- Existing system return temperatures will range from ?? to 75DegC
- Conventional heat pumps produce 55DegC efficiently, 65DegC at a push...
- They like nice low return temperatures >15DegC lower than flow...

Regulations

Stakeholders

Programme

- **High-temp. heat pumps, hydrocarbon refrigerant instead of synthetic.**
- Able to achieve upward of 75DegC flow & 65DegC return
- Moderate but reliable seasonal coefficients of performance – circa 3.0
- More complex, more expensive, larger, heavier...
- Substantial deployment in Europe but not in the UK... yet

Key Challenges

Data

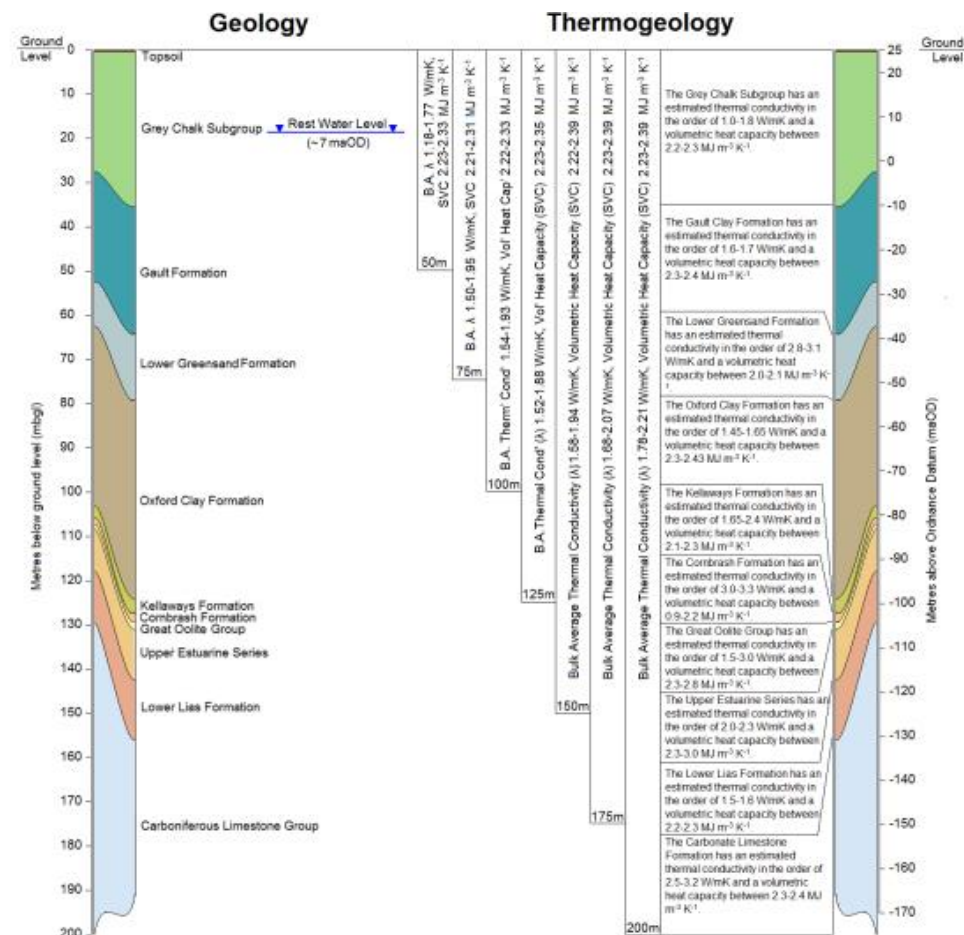
Technology

Engineering & Design

Regulations

Stakeholders

Programme



Key Challenges

Data

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Engineering & Design

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Closed loop - £35/m x 200m x 256 = £1.8m+ in borehole drilling alone...

- Achieving economic criteria of the project – IRR, ROI, CAPEX etc.
- Maximising carbon abatement
- Maximising revenue potential
- Maintaining resilience...

- **Hybrid air-source / ground source heat pump**
- Air source during warmer periods, ground source during cooler
- Offers ground-loops a chance to recover and replenish
- Reduces ground loops to 130 (-126), improves thermal performance

- **Thermal energy storage system**
- Balances load transients, smoothens peaks
- Allows tariff optimisation & opens up flexibility

Heat Network Route

Key Challenges

Data

Technology

Engineering & Design

Regulations

Stakeholders

Programme

Highways – New Roads & Streetworks Act 1991

- No statutory code for heat network pipes
- Therefore, no powers to install private apparatus
- Calor gas vs. Norfolk County Council 2019

Local Government Act 1976

- Provides that local authorities have the right to generate, distribute and sell heat.
- Sought Queens Counsel opinion on whether these powers entitle the local authority to lay pipework in the public highway!

Planning Application... a 'first of its kind' for the LPA too!

- EIA screening and scoping opinion, with a HRA screening
- Regulation 3 – CCC is its own determining authority
- Defining the scope of investigations with an evolving design & additions

Key Challenges

Data

Technology

Engineering & Design

Regulations

Stakeholders

Programme

Multiple Client Stakeholders

- Cambridgeshire County Council + Swaffham Prior Community Land Trust
- End-customer stakeholder groups / local residents
- Finding a solution that satisfies all...



Key Challenges

Data

Technology

Engineering & Design

Regulations

Stakeholders

Programme

A challenging and complex programme:

- Changing goalposts - Renewable Heat Incentive
- Grant milestones & requirements – HNDU & HNIP
- A ‘dynamic’ development pathway – evolving scope
- Unpredictability in end-customer take-up
- Complex critical path / task sequences and dependencies

Renewable Heat Incentive ends in April 2021

- Air source heat pumps must be installed, commissioned and registered
- Ground source heat pump projects may apply for ‘flexible tariff guarantees’, which extend the commissioning date to April 2022. However, you require planning permission, financial commitment and there’s a finite budget available for ‘FTG’ applications (currently c.£8M)



a project supported by:



Local authority challenge on developing the business case for a heat pump project

Alex Pearson, *Net Zero Projects Manager*, Midlands Net Zero Hub on behalf of Wychavon District Council

Evesham Leisure Centre

‘Wet’ Leisure Centre with gym



Available Energy Sources



Worcestershire
Local Enterprise Partnership



Evesham Leisure Centre

Annual Gas use = 2,211Mwh

Annual Electricity use = 640MWh

1MW CHP reaching end of life (replacement due in 5 years)

The ask:

Discuss the pros and cons of :

Waste heat from the sewage treatment works (top left on the map)

Water source heat pump from the River Avon

Air source heat pump

Roundtable

Miles Messenger, *Energy Engineering Director, Bouygues E&S Solutions*
Sheryl French, *Assistant Director, Cambridgeshire County Council*
George Day, *Senior Policy Advisor, Energy Systems Catapult*
Christopher Holland, *Project Manager, LASER Energy*
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Closing Remarks

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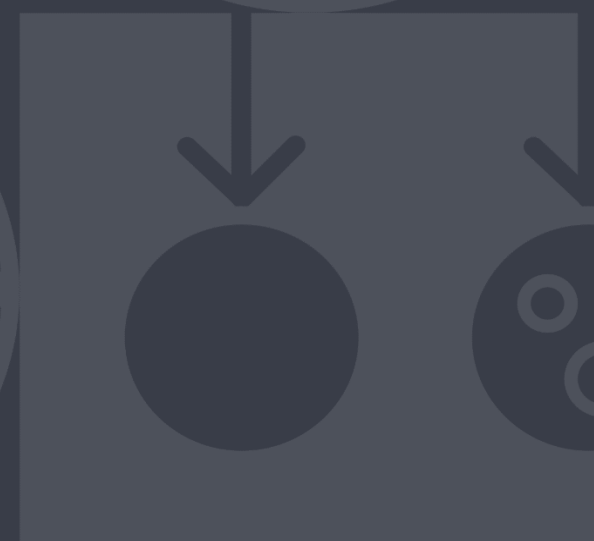
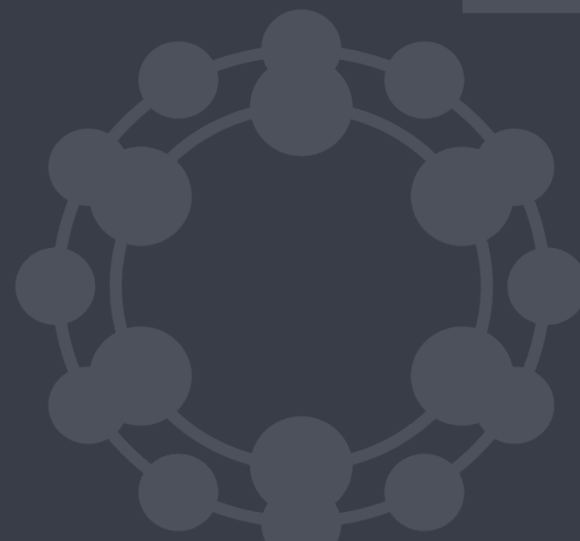
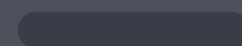
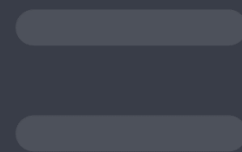
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- **To follow us** for events and announcements <https://www.linkedin.com/company/net-zero-go/>

Thank you for joining us and we look forward to seeing you on Net Zero Go and sharing more with you in the future



CO₂



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UK Research
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Department for
Energy Security
& Net Zero