HEAT AND THE CITY

Heat Networks: Planning for a Zero-Carbon World

UK Local Authority District Energy Vanguards Network

Bristol, 19 November 2019

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Heat Networks Investment Project

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Heat Networks Investment Project – The Story So Far

Climate Change Commitments

- UK was first major economy to pass net zero emissions by 2050 target into law

- It is estimated by the Committee on Climate Change that around 18% of UK heat will need to come from heat networks by 2050 if the UK is to meet its carbon targets cost-effectively

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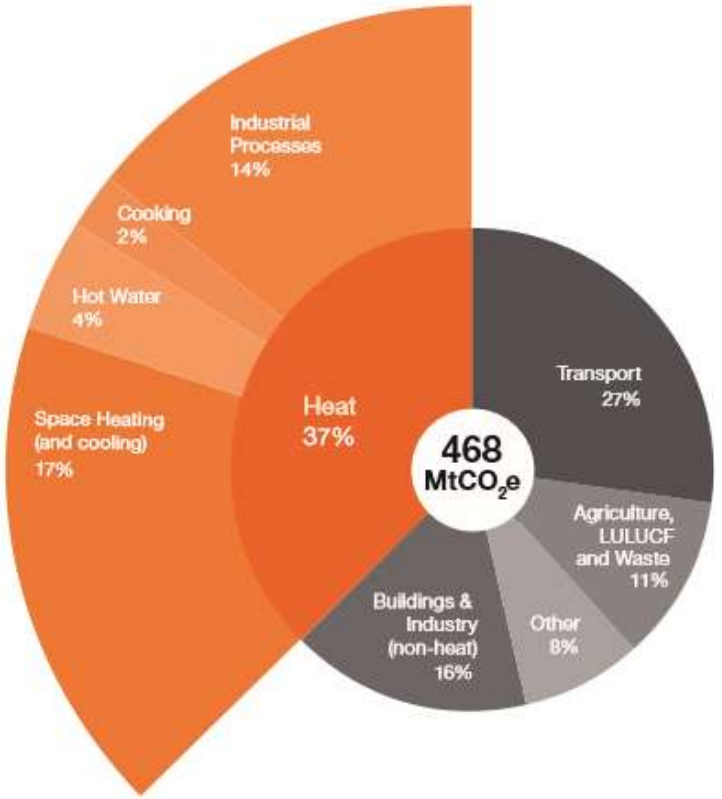
Carbon emissions

EMISSIONS FROM HEAT = 37%

Estimated UK Emissions Attributable to Heating, 2016



Source: BEIS 2018, Transforming Heat

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Heat networks part of the solution

- Central source of production through to multiple sites
- Reduce emissions
- Reduce bills
- Increase resilience
- Increase flexibility

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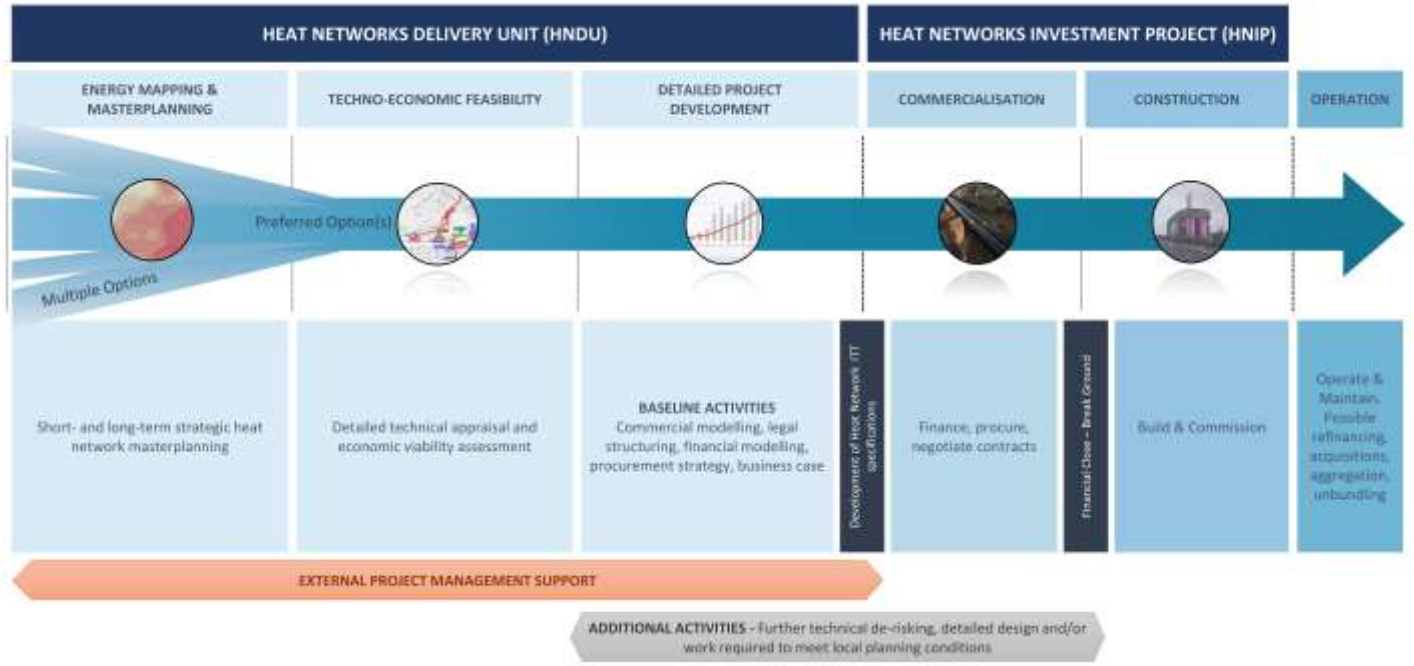
The Heat Networks Investment Project (HNIP) is a major Government project which will invest up to £320m of capital funding in heat network projects, leveraging around £1bn of private investment.



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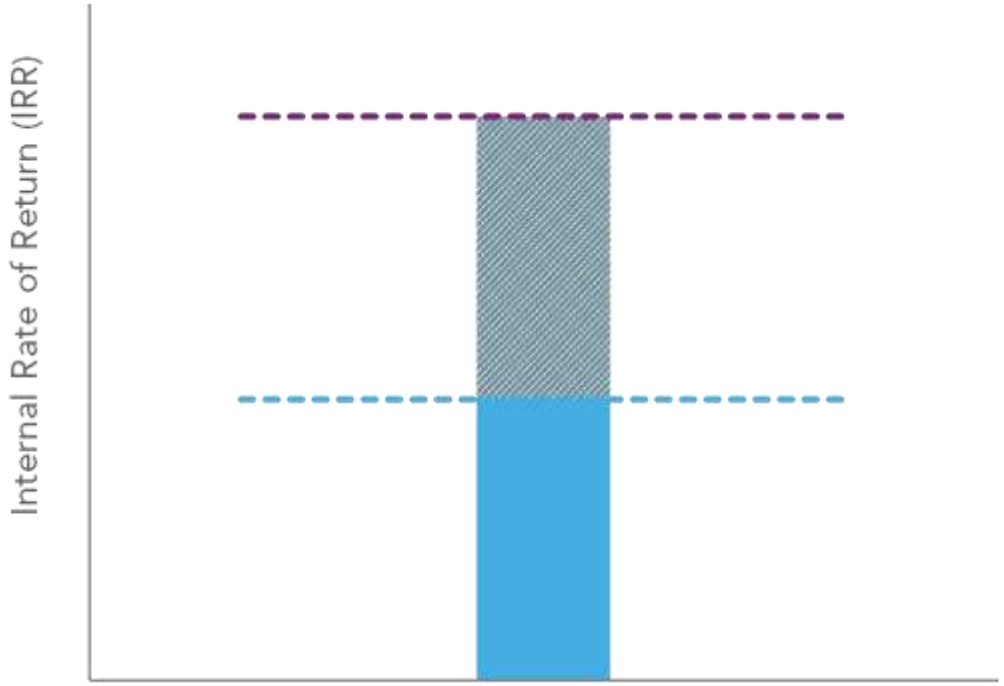
How are grants/loan amounts calculated?



Post HNIP funding, IRR sufficient to fully fund project

HNIP gap funding

Pre HNIP funding, IRR too low to fully fund project

We use our model based on your inputs to work out how much grant (or loan) is needed to enable your scheme to reach the required IRR

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Competition Dates

Round	Pre-Application Closing	Full Application Closing	Investment Committee
1	06 March 2019	05 April 2019	12 June 2019
2	05 June 2019	05 July 2019	22 August 2019
3	20 September 2019	18 October 2019	28 November 2019
4	04 December 2019	03 January 2020	13 February 2020
5	04 March 2020	03 April 2020	14 May 2020
6	03 June 2020	03 July 2020	13 August 2020
7	02 September 2020	02 October 2020	12 November 2020
8	02 December 2020	04 January 2021	11 February 2021
9	03 March 2021	02 April 2021	13 May 2021
10	02 June 2021	02 July 2021	12 August 2021
11	01 September 2021	01 October 2021	11 November 2021
12	01 December 2021	07 January 2022	17 February 2022

All competition dates subject to change

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Key Themes So Far

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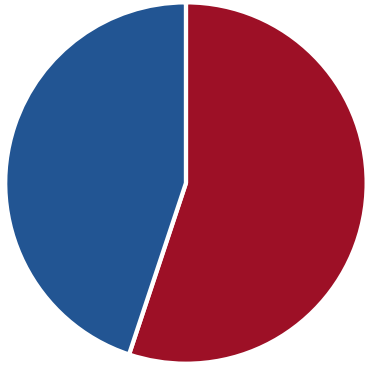
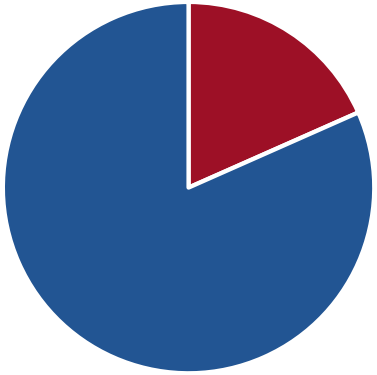
Statistics Summary

We are pleased with the number of applications and the range of projects represented.

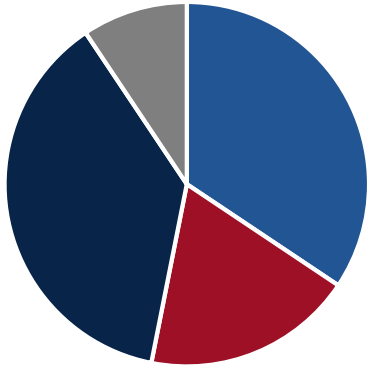
50 pre applications submitted



Both new and existing schemes



GWh delivered per year (exc. Network losses)



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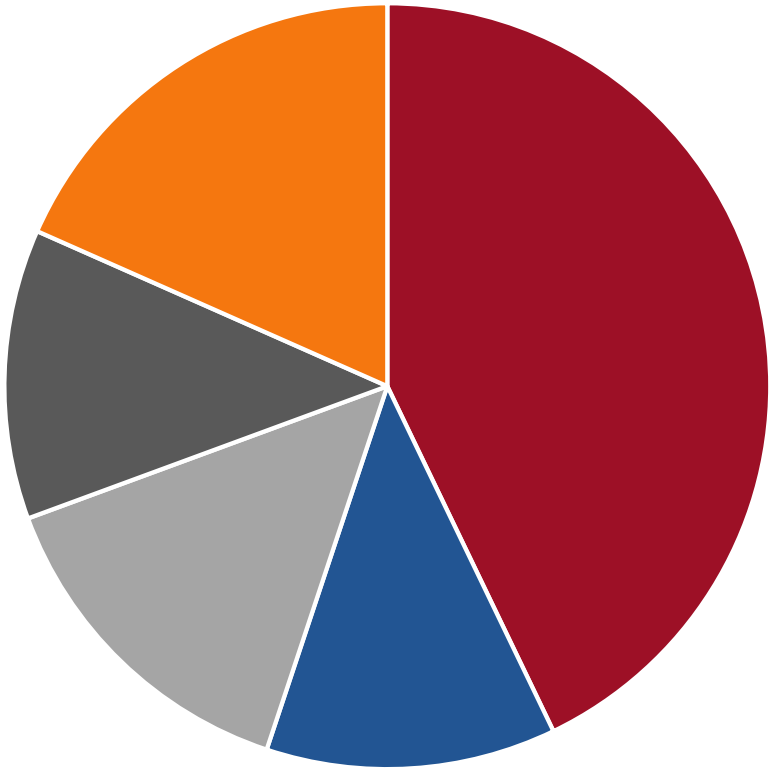
Statistics Summary

Range of technology types



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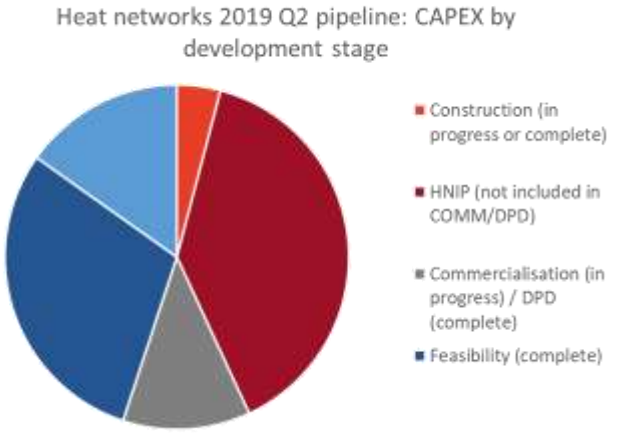
Strong pipeline and investor engagement

Capex Pipeline:

£1,242m of which £484.4m relates to HNIP projects



- Over 400 people have registered for our events to date.
- The investor conference had approximately 100 attendees.

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Support throughout the application process

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Ken Hunnisett

Lauren Bright

Amy Fry

Nick Good

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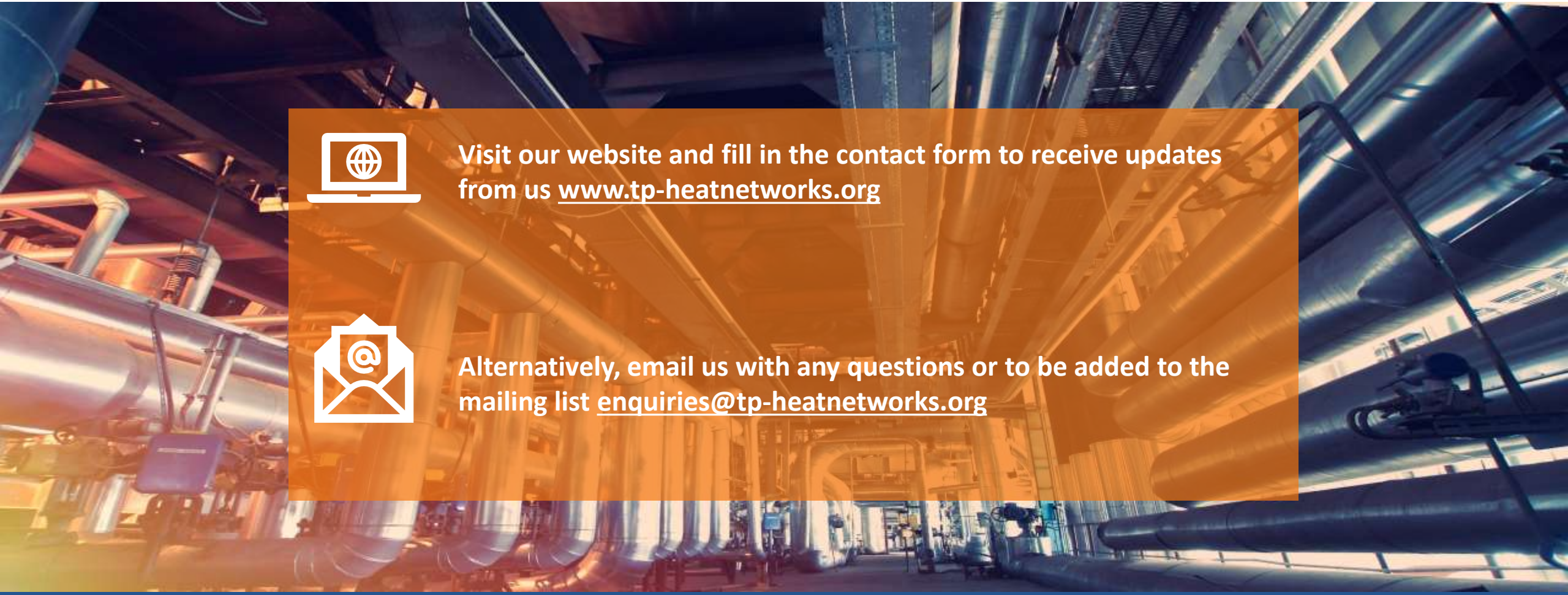
Thank you. Any questions?



Visit our website and fill in the contact form to receive updates from us www.tp-heatnetworks.org

Alternatively, email us with any questions or to be added to the mailing list enquiries@tp-heatnetworks.org

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Peter Russett

FVB District Energy UK

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FVB District Energy UK Ltd

The Complete Energy Consultancy

HEATING – COOLING – HEAT PUMPS – CHP – PROCESS – THERMAL STORAGE

Introducing FVB

- *FVB UK is an Anglo-Swedish Planning, Engineering and Management Consultancy.*
- *Combination of Business and Technical Skills Focused on District Heating & Cooling Networks and Specialising in:*
  - *Techno-Economic Support During the Full Project Lifecycle*
  - *Heating & Cooling District Networks*
  - *Energy Productions sources, including:*
    - *Combined Heat & Power*
    - *Heat Pumps*
    - *Energy from Waste*
    - *Biomass*
    - *Boiler Based Plant.*
  - *Thermal storage*
  - *Process systems*

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FVB's Philosophy

Exponential Energy Solutions®

Vision

- *FVB's goal is to be the UK's leading consultant for energy solutions that are sustainable from an engineering, economic and environmental viewpoint. We term this E^3, or Exponential Energy Solutions.*

Mission

- *Guide our clients through an uncertain energy future using our continually expanding experience with the latest technologies and business strategies.*

Business Concept

- *FVB provides complete business and technical guidance for energy system development, from idea, through design, financing, construction, commissioning and operation.*

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Global Presence – Local Solutions

FVB has over two hundred District Energy focused employees world-wide; with offices in Sweden, United Kingdom, Canada and the United Sates of America; FVB has consulted in District Energy for 50 years, working in over 30 countries.

FVB are Bringing the best in class Scandinavian experience, knowledge and delivery capabilities to the UK market.

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Services

Feasibility and Master Planning

- Feasibility Studies
- Energy modelling
- Master Planning, Energy Mapping
- Energy and Environmental Polocy
- Marketing and Sales consulting

Design & Engineering

- Design from Feasibility to Construction
- 3D Design
- Specification & Tender Documentation
- Control Strategies
- Detailed pipework and route appraisal
- Network Hydraulic [Netsim] and Buried Pipeline Stress Analysis [Rohr2]
- CDM Compliance
- BIM Design

DH Network Adoption Support

- Design Due-Diligence
- Owners Engineer
- Commissioning and Operational Support
- Performance Assurance
- Financial Modelling & Business Assessment

Site Operation Support

- Scheme Optimisation
- LTHW Conversion and modification
- Operating network Hydraulic Analysis and Modelling
- Network Extensions

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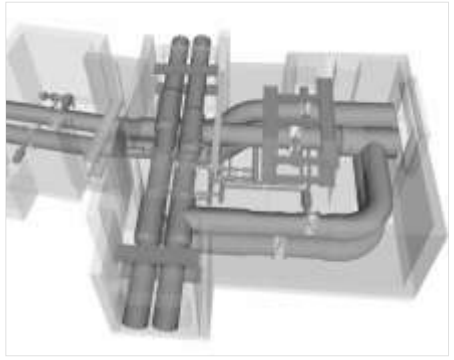
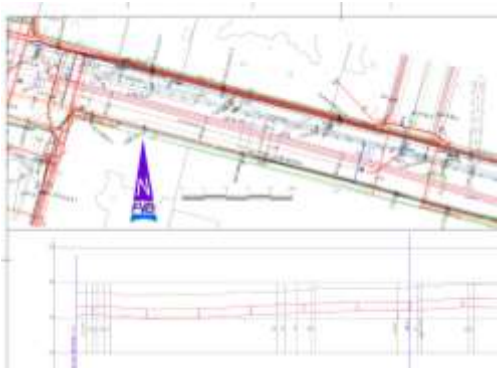
Areas of Operation

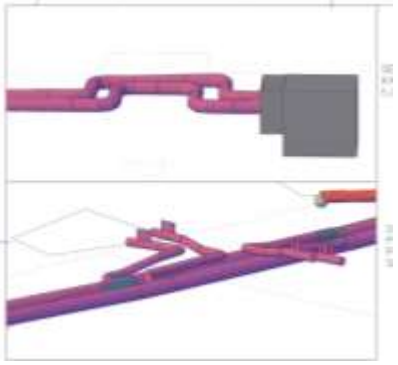
Exponential Energy Solutions®

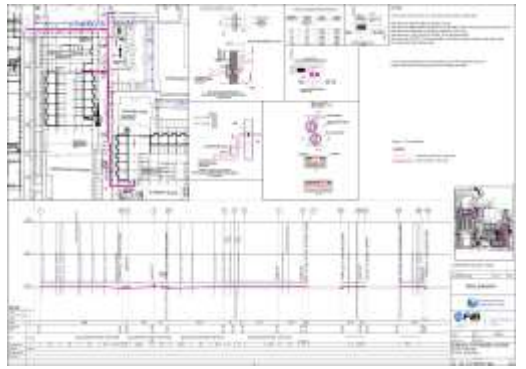
- District Heating and Cooling Networks
- Low Carbon Networks
- Energy Centres
- Heat Pumps
- Thermal Storage
- Combined Heat & Power
- Energy from Waste
- Industrial Waste Heat
- Boiler Plant
- Solar Thermal
- Deep Water Cooling
- Gas Peaking Plant
- Steam System Design

FVB









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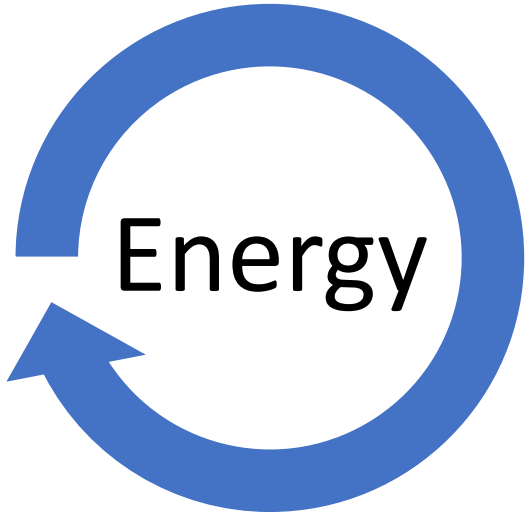
Future-proofing of District Heating



Energy Trilemma

- Carbon Emissions
- Security of Supply
- Energy Costs

District Heating is an energy delivery system

A heat network can be used by multiple heat sources, including low carbon and waste heat to reduce CO2 emissions and provide reliable supply.

Heat networks can deliver heat at a cost comparable to individual gas boilers and at a lower cost than electric heating.

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Adaptable District Heating

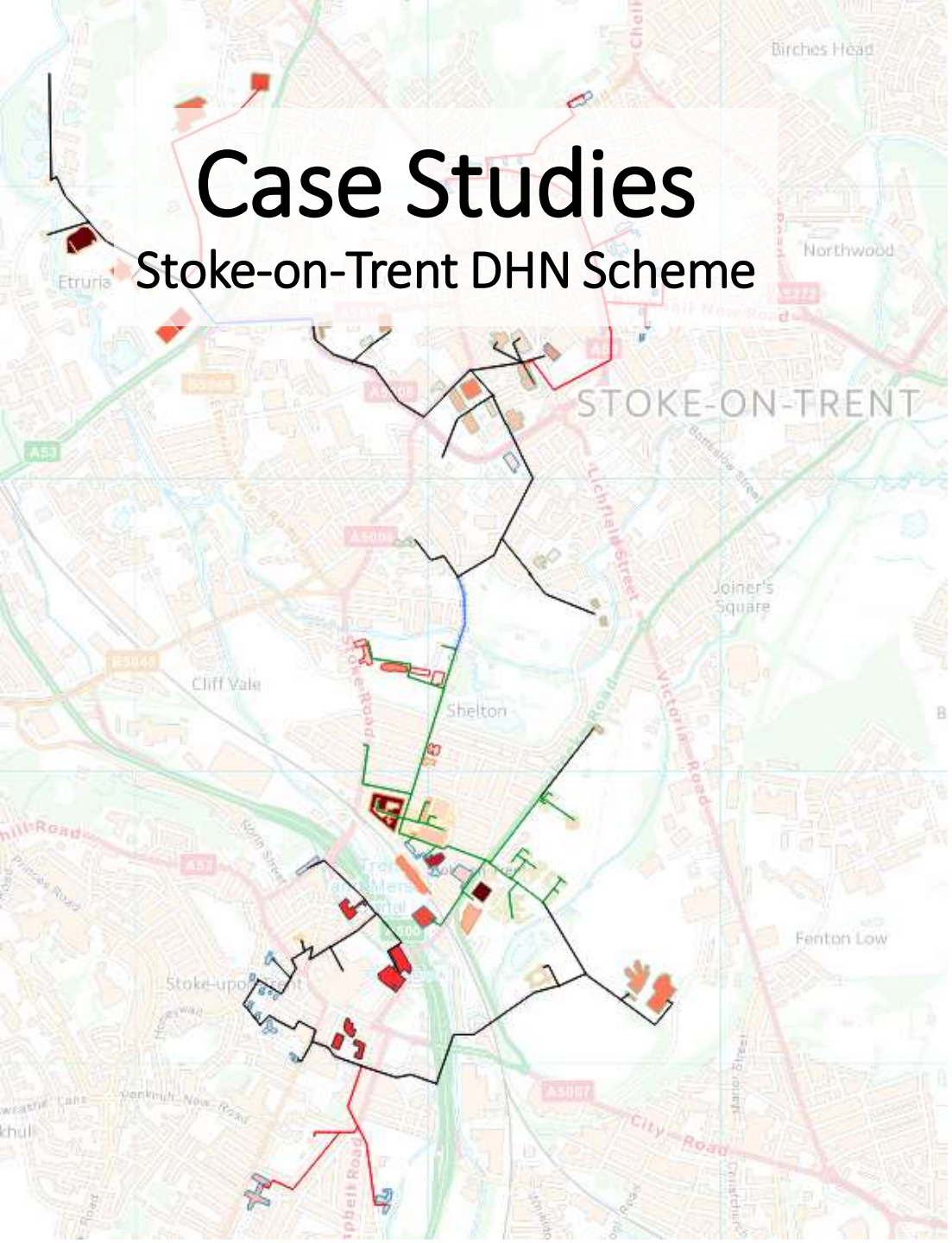
Key future proofing District Heating principles:

- *A high grade heat source* can supply a *low grade heat network*, but not vice versa.
  - Reducing operating flow and return temperatures. Current 4th generation DH systems can achieve 60-65°C flow and 30-35°C return temperatures.
  - This enables the use of low grade and low carbon heat sources – Heat Pumps and waste heat.

- *A low grade/low pressure heat source* can use a heat network infrastructure rated for *high grade/high pressure heat*, but not vice versa.
  - Install main carrier pipes that are rated for higher temperature or pressure to allow for DH networks link, capacity increase and connection to a different heat source in the future.

Case Studies

Stoke-on-Trent DHN Scheme



The District Heating System

- District Heating Network is to connect over 130 buildings within Stoke on Trent, connecting Stoke Town, Staffordshire University, Stoke College, Etruria and Hanley areas.
- Total design heat production is approx. 48GWh/year mainly produced by Energy from waste and Geothermal plant.

FVB Scope

FVB with their strategic partner, Natural Power, are the Mechanical & Electrical Design specialists for the DH scheme, supporting the SoT Council with design services across the installation of all aspects of the project including:

- Heat Distribution Network
- Energy Centres
- Local Connections and Heat Substations

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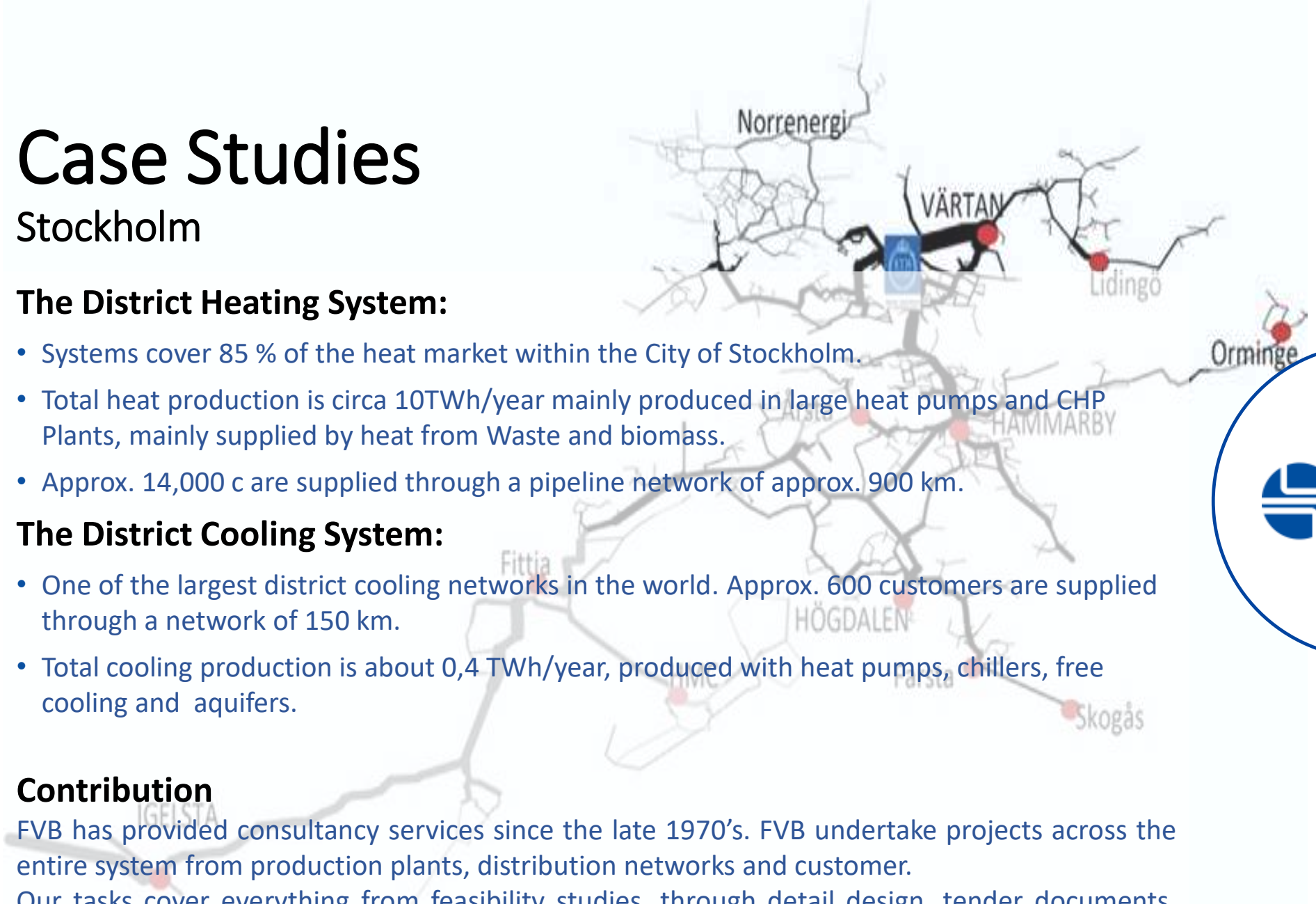
Case Studies

Stockholm



The District Heating System:

- Systems cover 85 % of the heat market within the City of Stockholm.
- Total heat production is circa 10TWh/year mainly produced in large heat pumps and CHP Plants, mainly supplied by heat from Waste and biomass.
- Approx. 14,000 c are supplied through a pipeline network of approx. 900 km.

The District Cooling System:

- One of the largest district cooling networks in the world. Approx. 600 customers are supplied through a network of 150 km.
- Total cooling production is about 0,4 TWh/year, produced with heat pumps, chillers, free cooling and aquifers.

Contribution

FVB has provided consultancy services since the late 1970's. FVB undertake projects across the entire system from production plants, distribution networks and customer.
Our tasks cover everything from feasibility studies, through detail design, tender documents, evaluations to supervision during construction and commissioning.

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Achieving Zero Carbon

Västerås – *A Swedish Example*

- Population of approx. 150,000
- Second city in Sweden to have a DH scheme
- DH scheme commenced in 1954
- 98% of heat supplied by DH scheme, 1800GWh/year with a peak load of 600 MW
- 31MW cooling network – mainly through free-cooling from Lake Mälaren
- 34GWh/ year electrical energy production

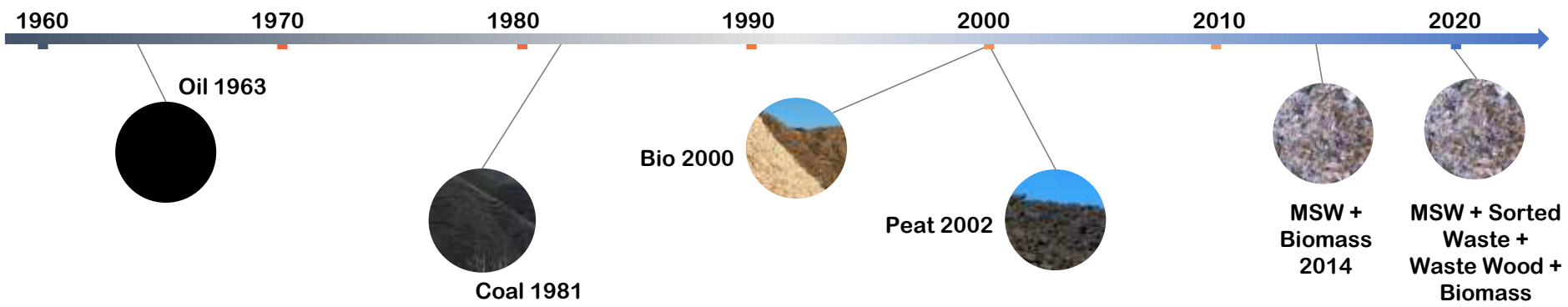
In 2018 Västerås became carbon neutral in its supply of heat.

- Heating plant utilises:
  - Energy From Waste Plant
  - Biomass
  - Heat Pumps
- Thermal storage capacity of 49,000,000 litres

Achieving Zero Carbon

Västerås – *A Swedish Example*

The Fuel Timeline



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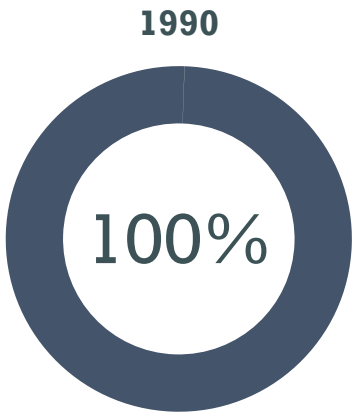
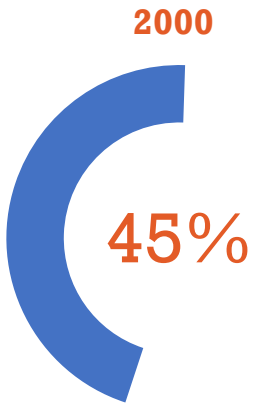
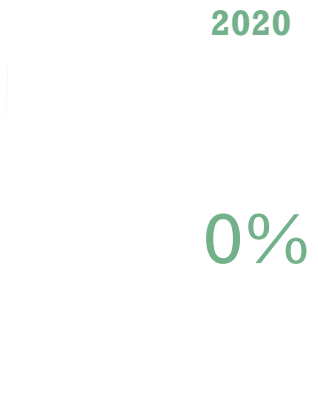
Achieving Zero Carbon

Västerås – *A Swedish Example*







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HEATING & COOLING
HEAT PUMPS
CHP
PROCESS
THERMAL STORAGE

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Andy Yuill

Natural Power

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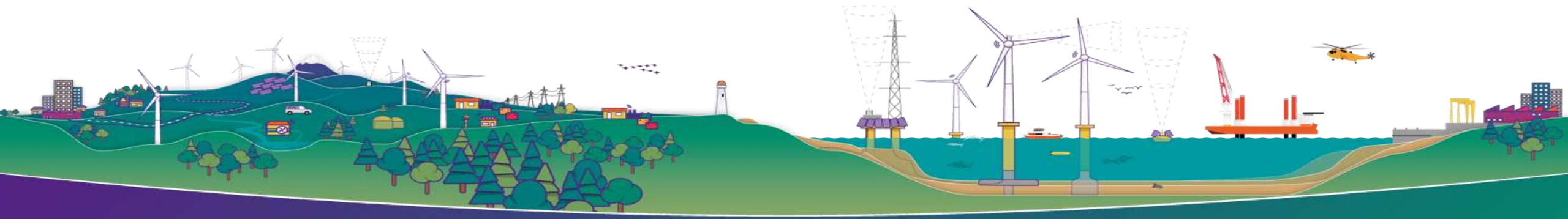
Planning for Low Carbon Heat

Vanguards – Bristol 2019

Date: 19th November 2019

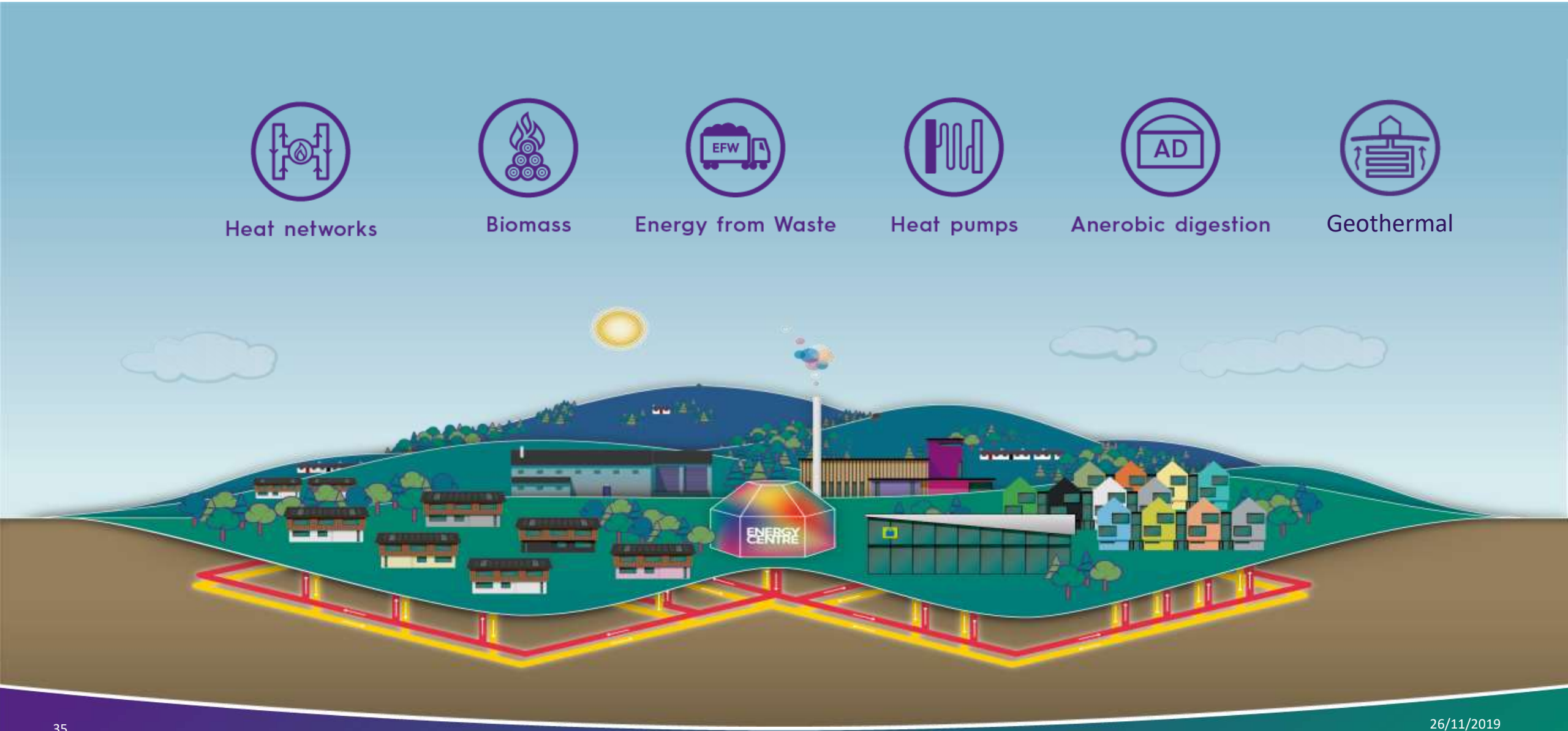
Produced By: Andy Yuill

Produced For: Vanguards



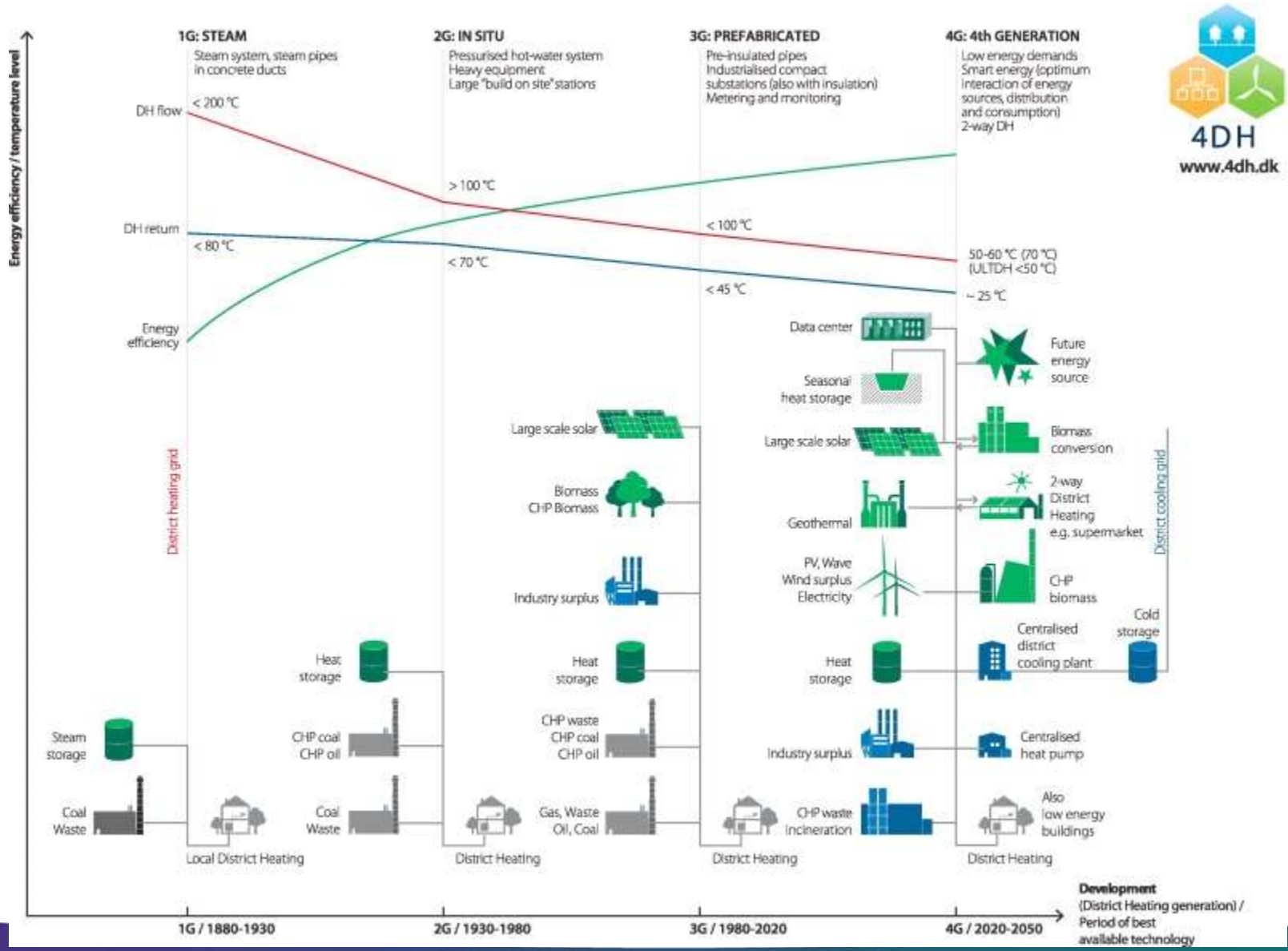
Our services

Renewable Heat



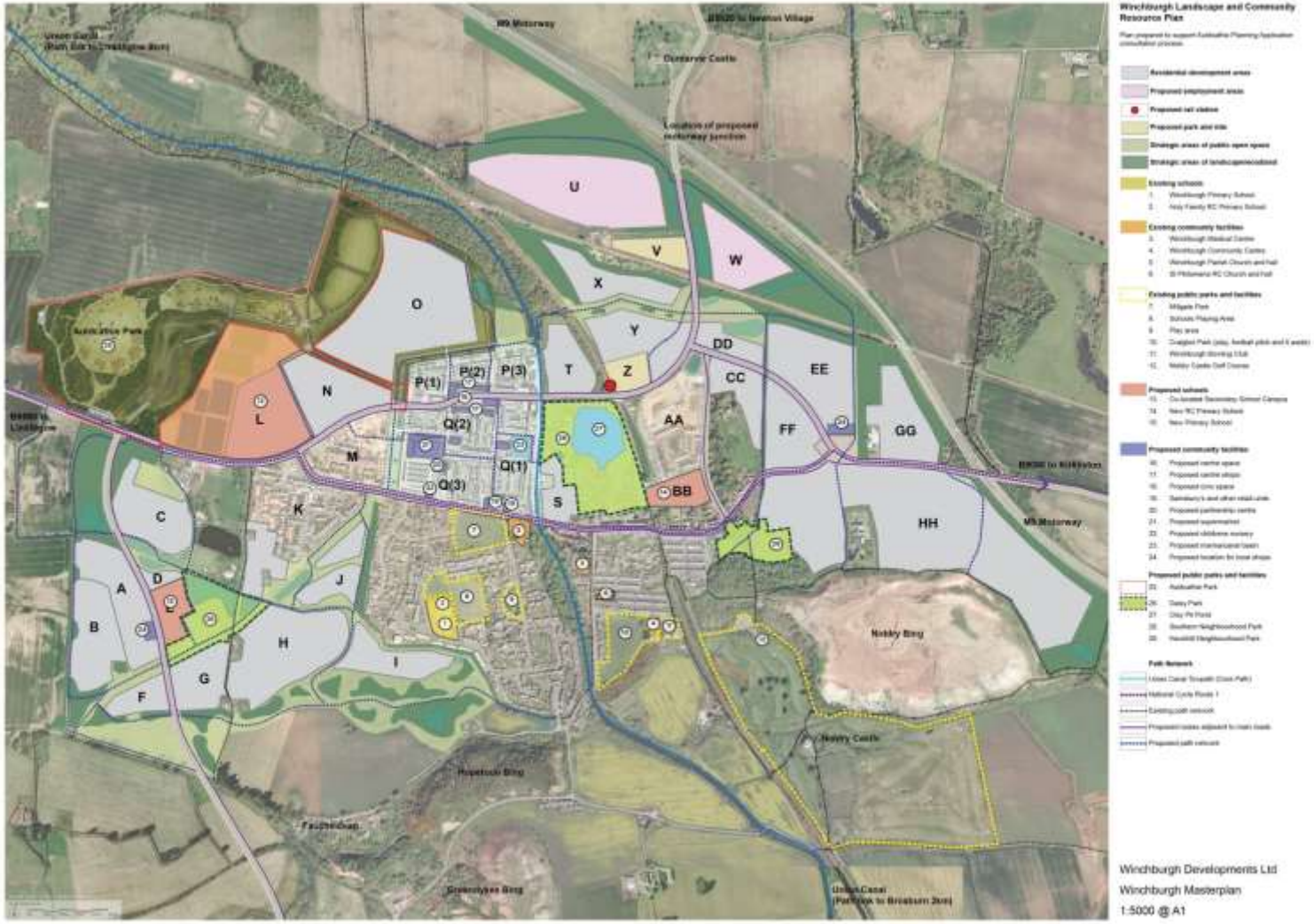
Evolution of District Heating

It's been on a journey….



4th Generation is actually very difficult.

(but not impossible!)


M6 Motorway
Dunsyre Castle
Location of proposed motorway junction
U
V
W
X
Y
Z
O
N
L
M
P(1)
P(2)
P(3)
Q(1)
Q(2)
Q(3)
T
DD
CC
EE
FF
GG
AA
BB
S
K
C
A
B
D
J
H
I
G
F
HH
M6 Motorway
Nisbet Burn
Nisbet Castle
Faulhillhead
Greenhyaes Burn
Winchburgh Landscape and Community Resource Plan
Winchburgh Developments Ltd
Winchburgh Masterplan
1:5000 @ A1


Demand – Volume + Profile
Future developments
DATA

Heat Demand

Half Hourly Metered = ☺

Estimated from

Heat Profile

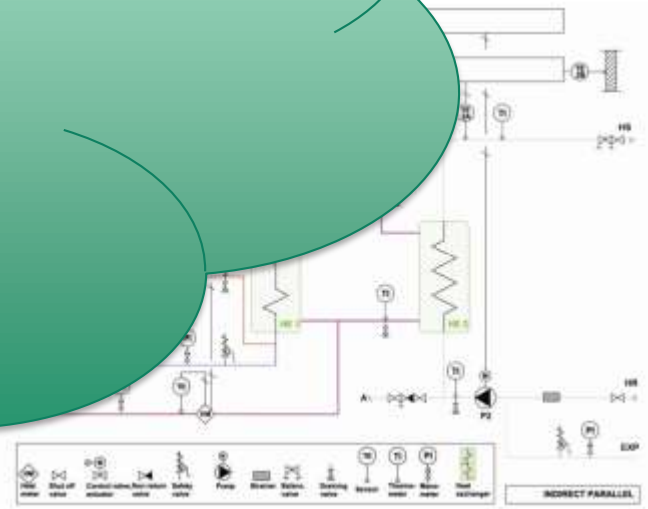
Extracted from BMS =

Secondary Side

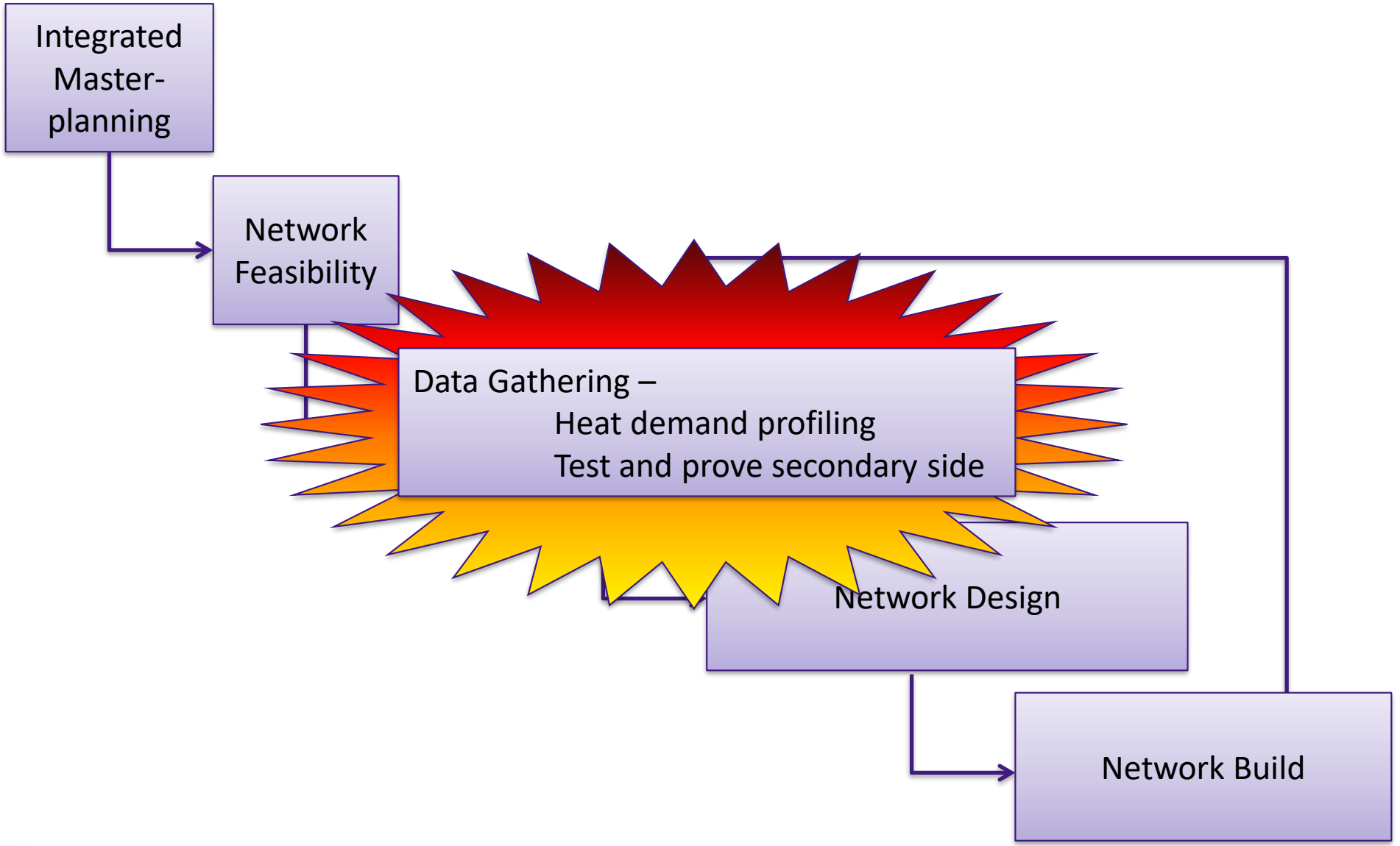
and Validated = ☺

Visit = ☹

TIME

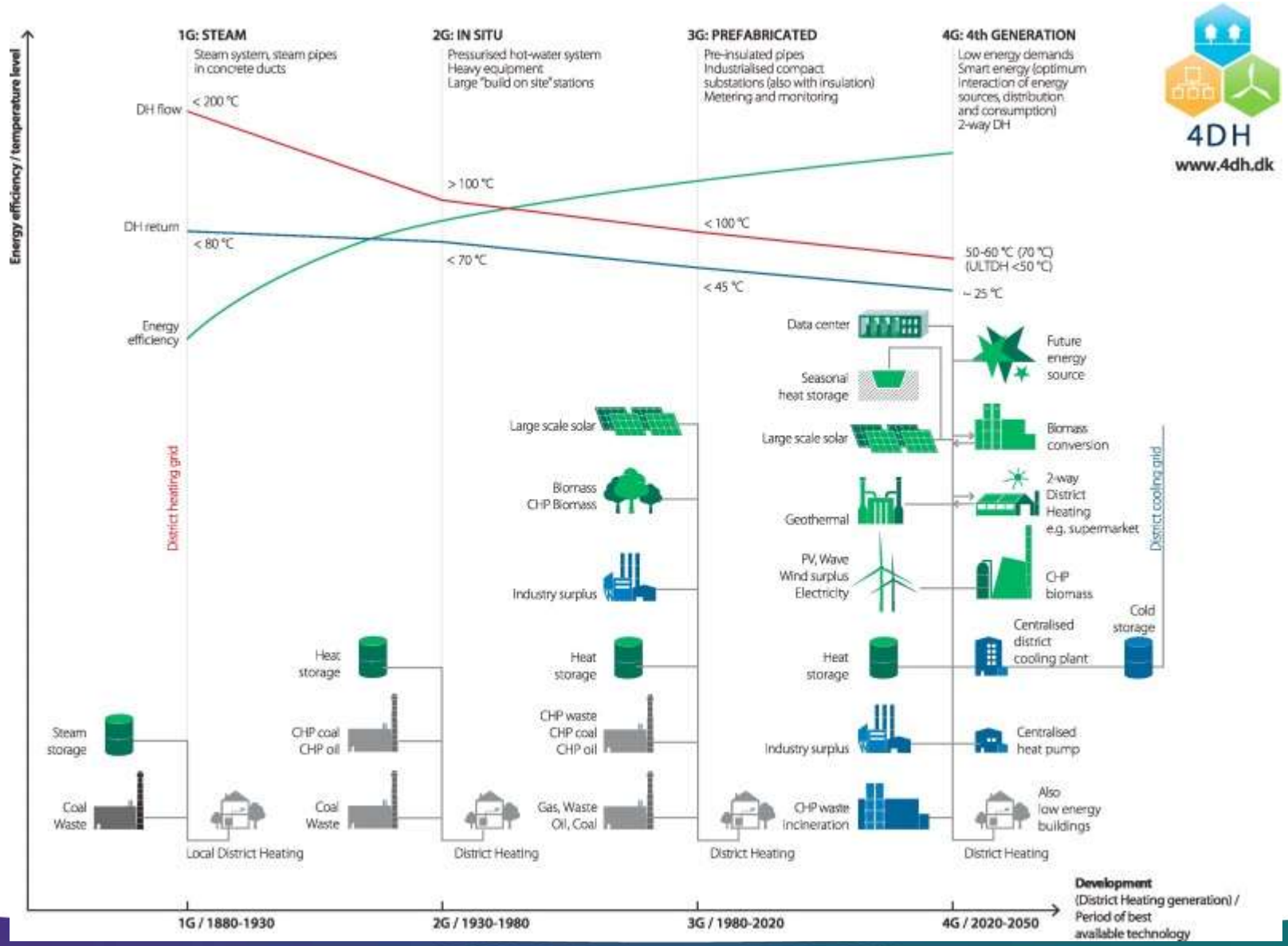


Roadmap to implementation



Planning for District Heating

Plan for 4th generation



HEAT AND THE CITY

Ian Allan

Switch2

VATTENFALL

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Switch2 Energy

Making a success of heat networks

Over 35 years' experience

164 employees

40 engineers

35,000 PAYG customers

600 schemes

Serving 80,000 customers

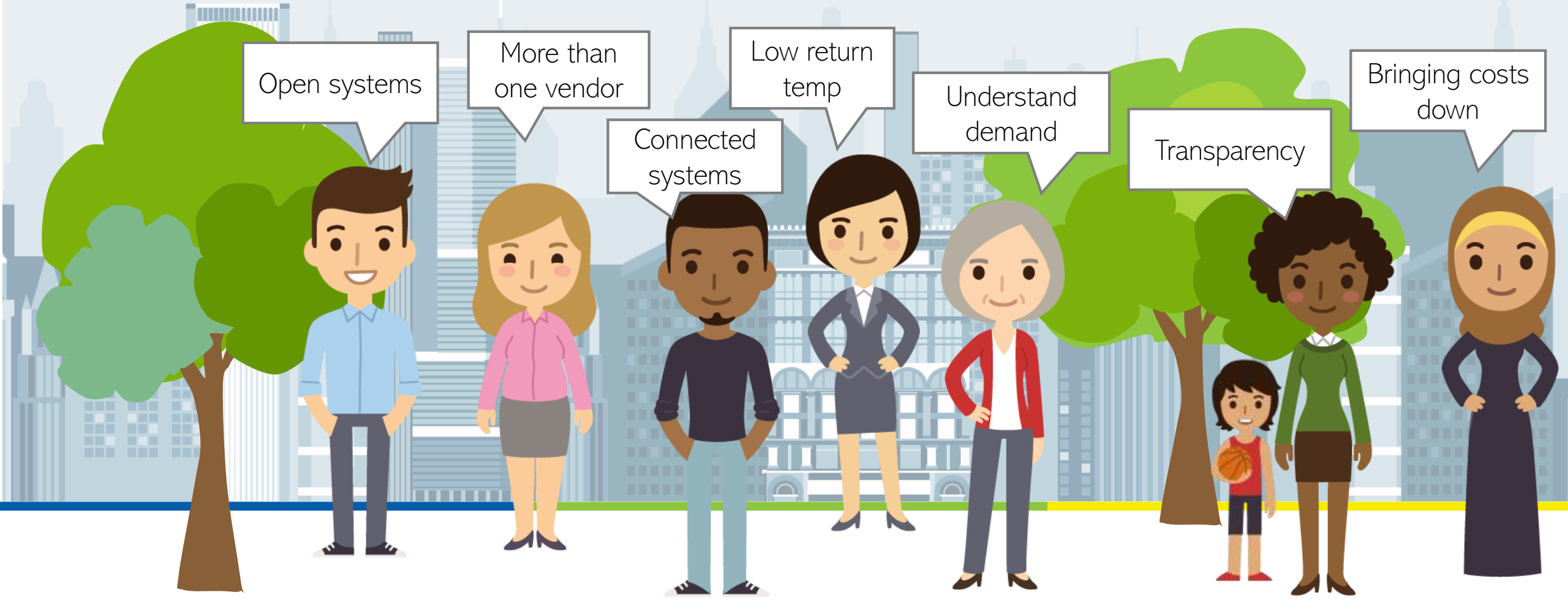
Processing £26 million in payments

105 energy centres

280,000 bills sent annually

What is it all about?

Money and the environment



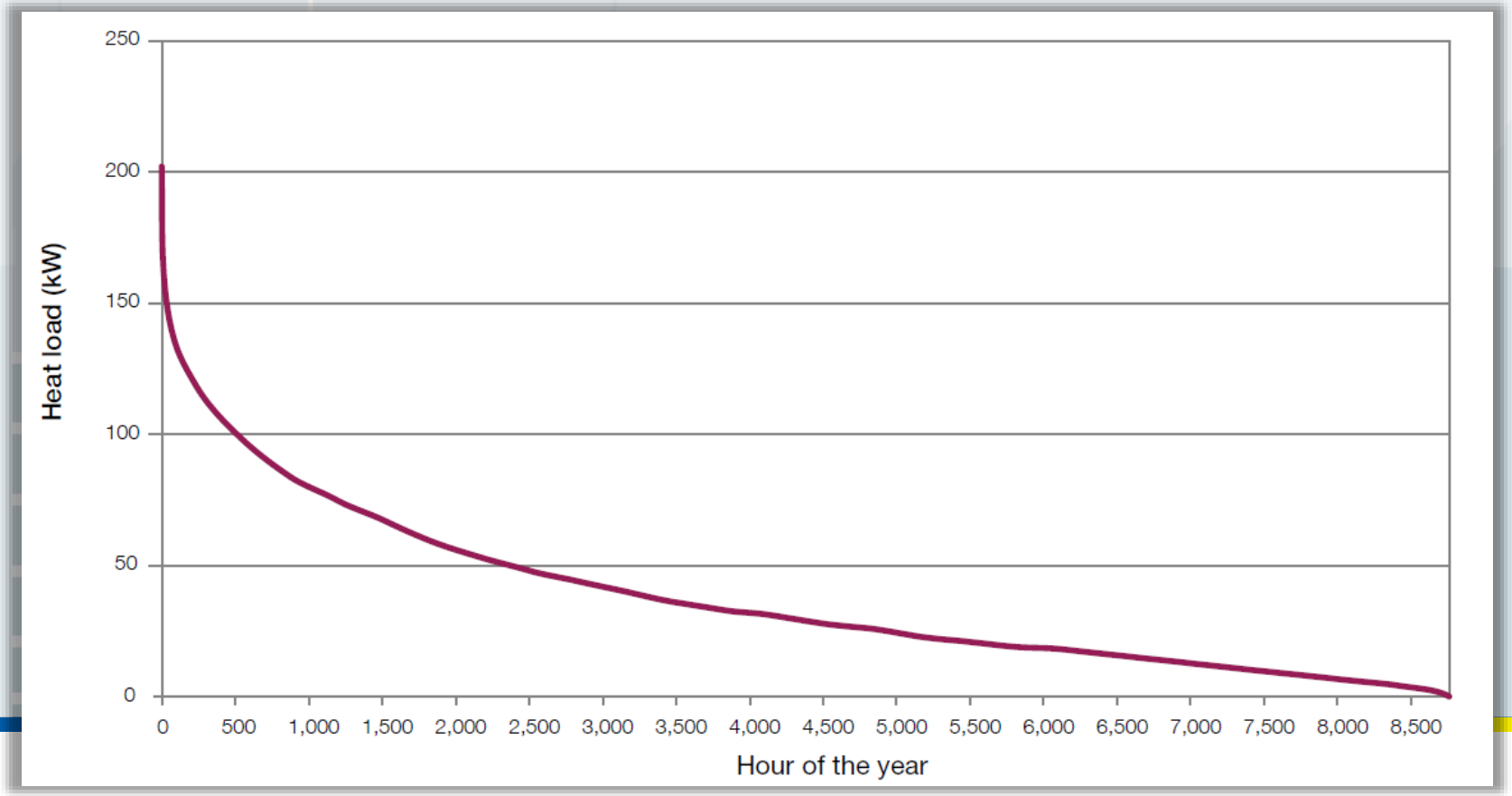
optimise

switch2

End-to-end operations & maintenance

Final thoughts:

Heat demand curve



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