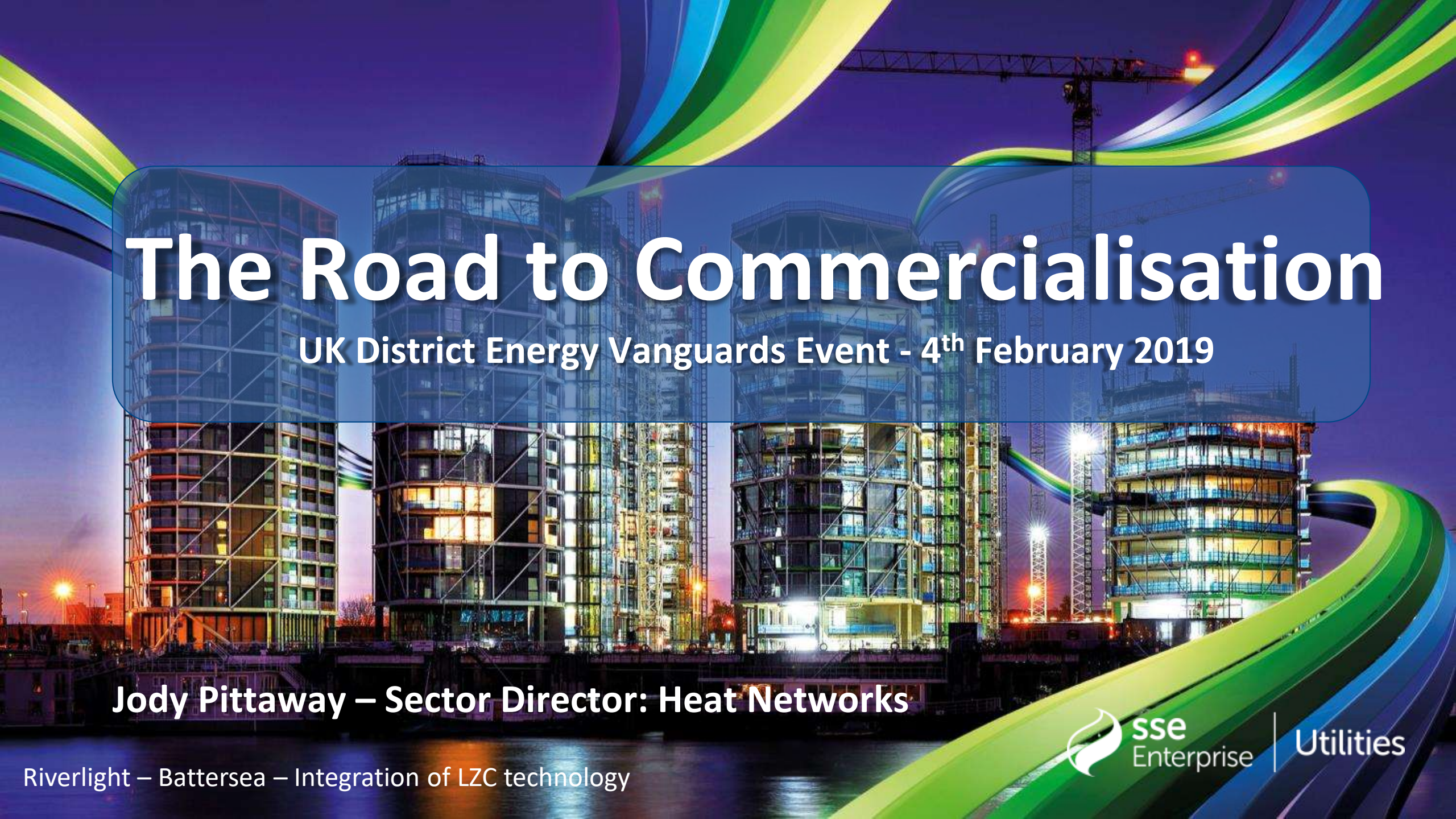
Heat Networks: The Road to Commercialisation

UK Local Authority District Energy Vanguards Network

London, 4 February 2019

Jody Pittaway

SSE



The Road to Commercialisation

UK District Energy Vanguards Event - 4th February 2019

Jody Pittaway – Sector Director: Heat Networks

Riverlight – Battersea – Integration of LZC technology

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About SSE…

FAIR TAX MARK ACCREDITED SINCE 2014

LIVING WAGE EMPLOYER SINCE 2013

B RATING FOR ITS CLIMATE CHANGE PROGRAMME RESPONSE

CREATING AND IMPLEMENTING SSE'S INCLUSION STRATEGY WITH INCLUSION SPECIALISTS

RANKED #1 IN THE FTSE350 FOR INCLUSIVE JOBS GROWTH

ANNUAL ECONOMIC CONTRIBUTION TO THE UK AND IRISH ECONOMIES CALCULATED SINCE 2012

BRITISH STANDARD FOR INCLUSIVE SERVICE PROVISION ACHIEVED FOR SSE'S RETAIL AND NETWORKS BUSINESSES

CERTIFIED WITH THE ONLY ACCREDITATION FOR RESPONSIBLE BUSINESS PRACTICE IN IRELAND

AAA (LEADER) RATING FROM MSCI ESG RESEARCH

COMMITTED TO MEETING THE TCFD RECOMENDATIONS IN FULL BY 2021

ONE OF TWO ENERGY COMPANIES GLOBALLY ON THE BLOOMBERG 2018 GENDER-EQUALITY INDEX

INCLUDED IN THE FTSE4GOOD INDEX SINCE 2014

sse Enterprise | Utilities

SSE Enterprise: Wide ranging skills & experience

- Multi-utility
- Electricity
- Gas
- Water
- Heat
- Electric vehicles
- BEM Systems
- Remote Optimal
- Business Energy Intelligence
- Energy Audits and Compliance
- ESOS
- Energy Performance Contracts
- Ethernet
- Cloud Connect
- Optical
- Dark Fibre
- Internet Access
- Co-location
- Mechanical & Electrical
- High Voltage services
- Street lighting
- Facilities management
- Renewable technologies
- Energy efficiency

For what's to come...

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SSE Heat Networks: A Quick Introduction

13 operational networks

3 new networks to be operational in 2019

Developer, land owner, housing association

Flexible business model

8,000 residential customers

15,000 residential customers at full build

96,000m² commercial customers

500,000m² commercial customers at full build

10MWe of CHP generation capacity

71MW of boiler generation capacity

3MW of heat pump generation capacity

16MW of chiller generation capacity

Lots of lessons learned!

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Some of those lessons…

1. Design for performance - max plant efficiency; min system losses; whole-system commissioning; O&M with contingency; & ensure performance accountability
2. Future-proof – Lowering emissions; & enable system expansion wherever possible
3. Communication plan with all tenants and owners at sales, through the conveyancing process and into operation (wider stakeholder engagement plan)
4. Focus on robust commissioning process with a “one team” approach (client and heat provider)
5. Provide on site customer support and focus on dealing with customer issues as soon as they arise to avoid issues escalating

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Complimentary skills & experience

Public Sector	SSE Enterprise
Strategic Masterplanning	Investment
Heat & Electricity Loads	Project Delivery
Planning Powers	Asset Management
Relationship with End Users	Ensuring Project Performance
Access Rights	Dedicated & Experienced Team
Social Outcomes: Air Quality, Carbon, Health & Wellbeing	Specialist Customer Services

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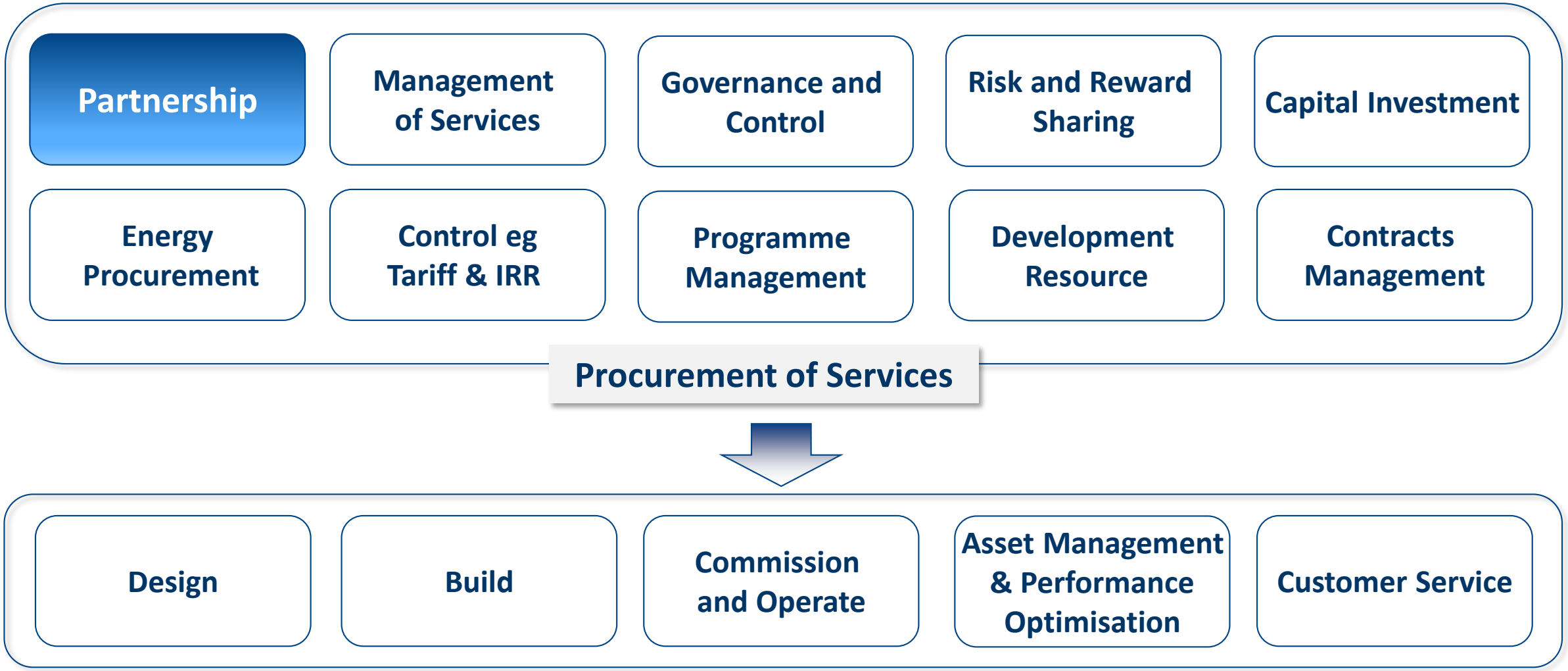
A Partnership Model



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Thank you for listening

Please get in touch:

Jody Pittaway
Sector Director – Heat Networks
SSE Enterprise | Utilities
E: jody.pittaway@sse.com

SSE Enterprise has provided valuable technical input which is based on its experience and learning from running heat schemes elsewhere.

SSE's experience in looking after heat customers combined with their significant customer service infrastructure was also very important to us.

Jason Wood,
Project Director, Hadley Mace

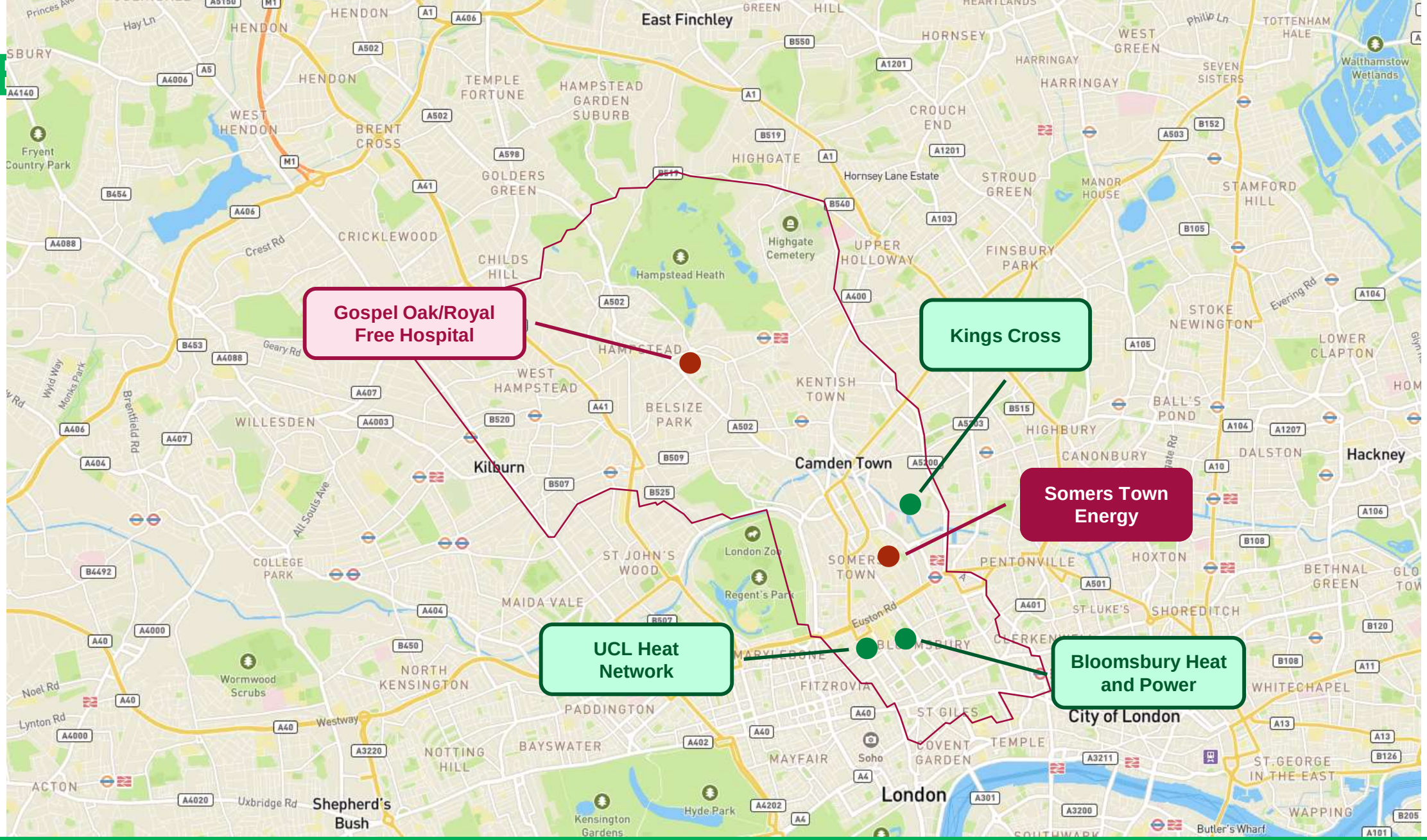
James Davies

London Borough of Camden

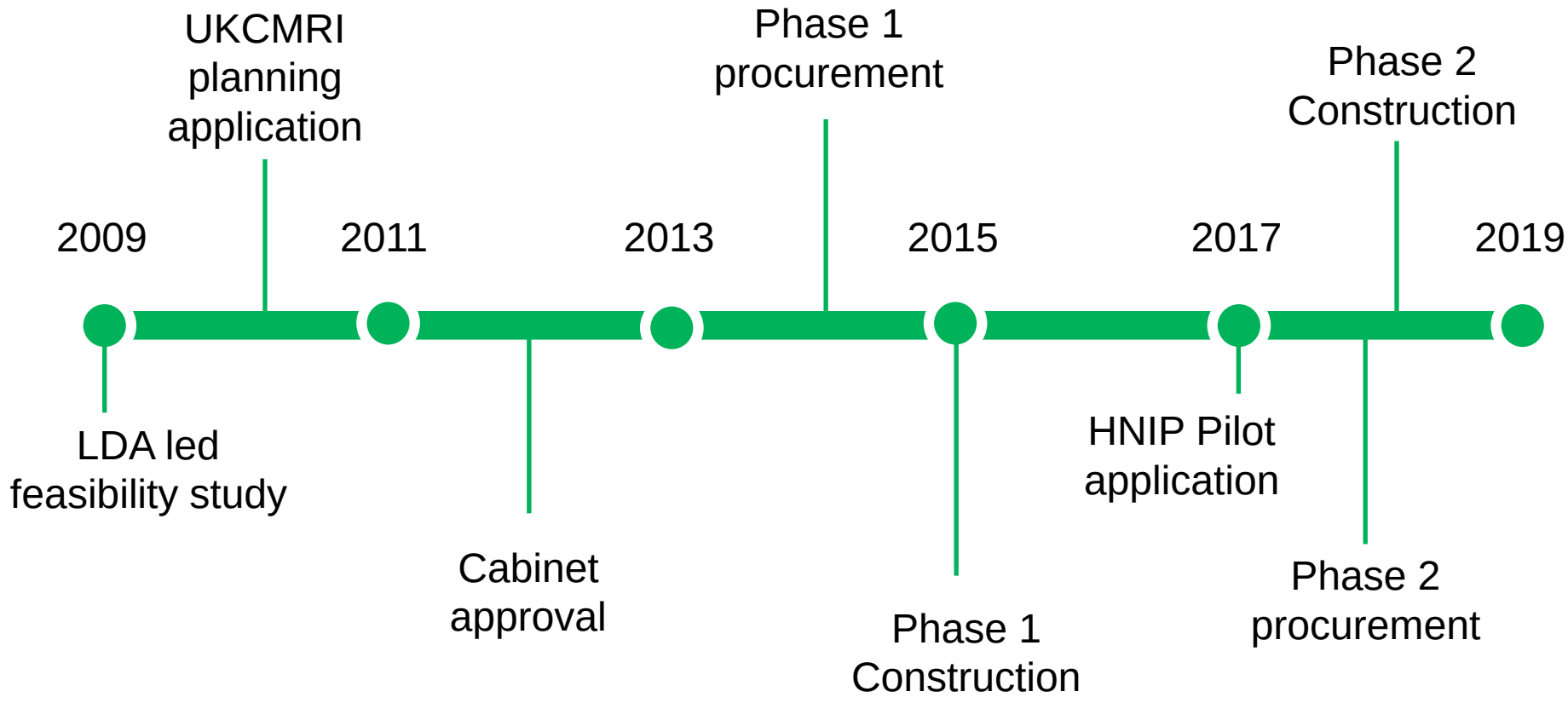
DEN in Camden

UK District Energy Vanguards Network
04/02/19

James Davies – Senior Sustainability Officer


Gospel Oak/Royal Free Hospital
Kings Cross
Somers Town Energy
UCL Heat Network
Bloomsbury Heat and Power
East Finchley
Hampstead Heath
Highgate Cemetery
Hornsey Lane Estate
Kilburn
Camden Town
London Zoo
Regent's Park
City of London
London
Hackney
Shepherd's Bush
Kensington Gardens
Hyde Park
Soho
Walthamstow Wetlands
Wormwood Scrubs
Butler's Wharf

Somers Town Energy



Somers Town Energy

Phase 1

- Operational since 2015
- 3 x 1.3 MW gas boilers
- 339 dwellings

Phase 2

- 2018-19 construction
- 901 MWe Gas CHP
- Additional 184 dwellings
- 2 non-domestic connections

Constraints

London

Risk

Specialism

Constraints

London

Risk

Specialism

Constraints

London

Risk

Specialism

Opportunities

Landlord

Politics

Diversity

Opportunities

Landlord

Politics

Diversity

Opportunities

Landlord

Politics

Diversity

Thankyou

James.Davies@Camden.gov.uk

James Davies – Senior Sustainability Officer

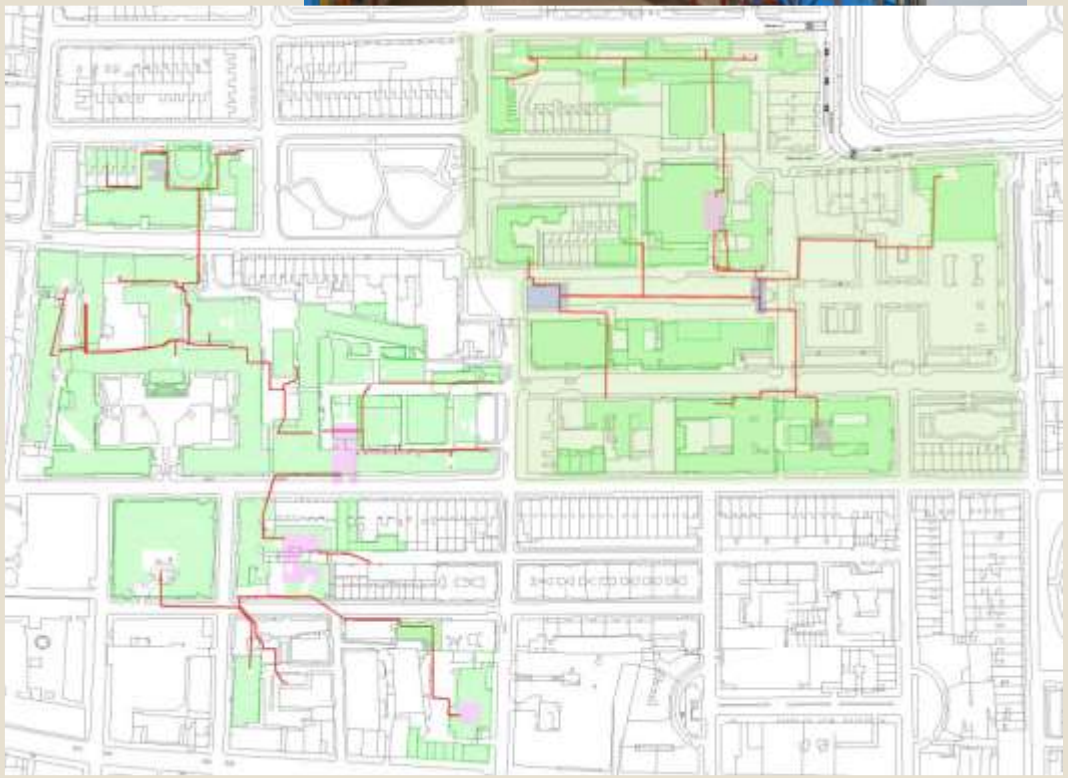
Stephen McKinnell

UCL SOAS









Bloomsbury Heat & Power Consortium II (BHPCII)

Brief for Multidisciplinary Consultant (MDC) for Detailed Feasibility Study/Draft Technical Specification and Detailed Options Appraisal

January 2018

Vimal Bhana

Joule Infrastructure

WHY ?

- Planning
- Build form & layout
- Part of the land deal ie offsite connections / serviced parcels

joule infrastructure

vimal@jouleinfrastructure.com
07450 710691

WHAT TO CONSIDER ?

- Customer tariffs, SLAs and protections
- Delivery vehicle structure & security
- Land / asset ownership

joule infrastructure

vimal@jouleinfrastructure.com
07450 710691

joule infrastructure

VIMAL BHANA

A housing association perspective

From Will Routh, Southern Housing

Objectives

Providing consistently **affordable heat for residents** through the lifetime of a contract, to reduce fuel poverty

Minimise financial risk (to the resident and to the HA of bad debts and unpaid heating/hot water charges

Maintaining customer service (despite reducing internal resource)

Constraints

Lack of **internal resource and expertise,** from adopting a reactive approach to planning policy

Commercial priority is given to new build

HAs want to **retain control of the customer relationship**

Short-term funding arrangements mean HAs often choose the **path of least resistance** when contracting

Charles Robson

Womble Bond Dickinson

womblebonddickinson.com

WOMBLE BOND DICKINSON

Evaluating Structures – a Methodology

Charles Robson

4 February 2019

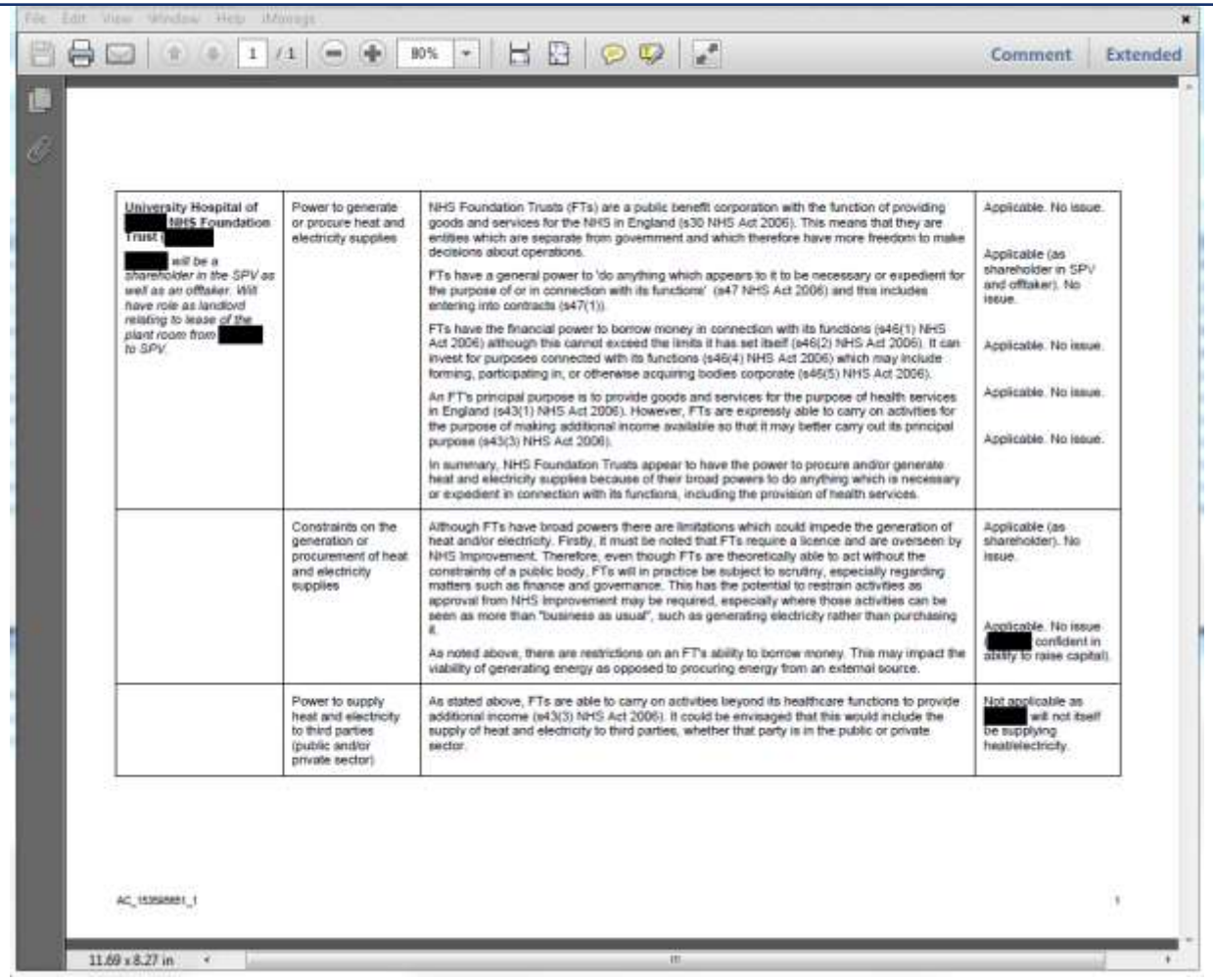
Evaluation Matrix

EVALUATION MATRIX				MODEL	
CRITERION	ISSUES	PARTICIPANT A (0 worst -5 best)	PARTICIPANT B (0 worst -5 best)	PARTICIPANT C (0 worst -5 best)	OVERALL SCORE (sum of all Participant scores)
Commerciality	For example, Does the Model give the Participant an appropriate level of influence? Does the Model ensure adequate security of supply for the Participant? Does the Model involve a degree of risk for the Participant which is commensurate with the Participant's rewards (financial, commercial, policy and other)? Is the Model adequately resilient? In other words, is it flexible enough to accommodate reasonably foreseeable future developments?				
Governance/Policy	For example, Does the Model help the Participant to implement its policy objectives? Is the role the Participant plays under the Model within the scope of its organisational/business purposes? Does the Model require the Participant to make commitments or constrain the Participant's freedom of operation in an unacceptable way (taking into account corresponding benefits to the Participant)? Does the Model involve any reputational risk for the Participant?				

Evaluation Matrix

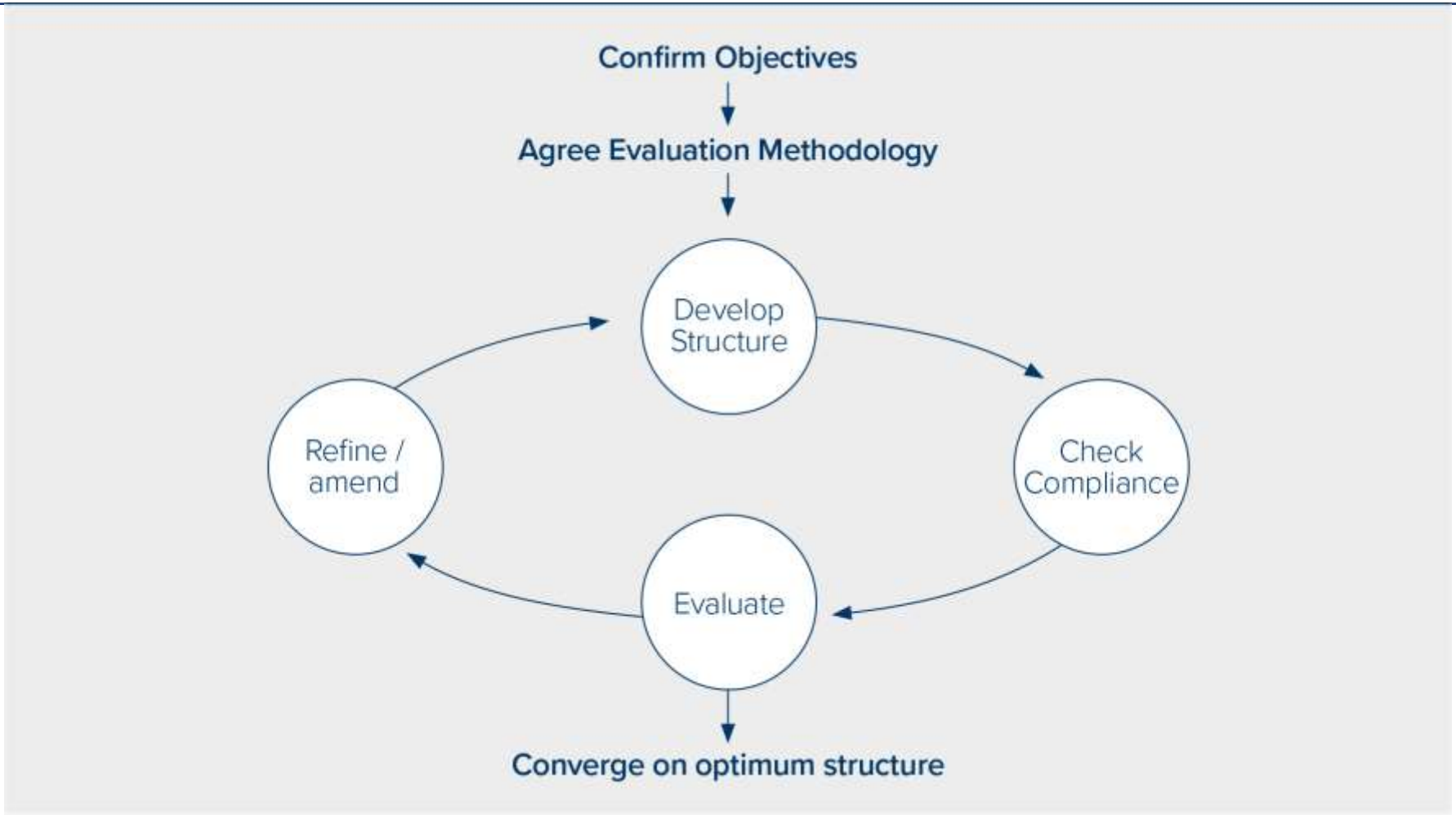
CRITERION	ISSUES	LA	UNIVERSITY	NHS TRUST
9. INFLUENCE OVER SCOPE OF THE JV	The Partner has adequate influence over the scope of activities of the joint venture/collaboration, including possible supply of energy to third parties	*Under this model, the scope of the JV is determined by the scope and duration of the Concession Agreement (since the SPV's rights are all derived from that document, rather than from ownership of the Energy System)* *Because each Partner would be a shareholder in the SPV, and would have a corresponding degree of influence over it, each Partner would be involved in all SPV decisions. However, Partner input to date suggests that Partners have differing appetite for development and expansion of the SPV's activities, and so this model may not be best aligned to the differing strategic objectives of each partner.*	*As per LA*	*As per LA*
10. COMPATIBLE WITH EXISTING ARRANGEMENTS FOR THE SUPPLY OF ENERGY	The Model is compatible with the Partner's existing arrangement for the supply of relevant energy services, including in particular in relation to termination/handover.	*LA's current arrangements appear flexible enough to accommodate this model if/when LA becomes an Offtaker. However this model would probably involve longer energy service contracts than is currently the case*	*Compatible with current arrangements because the existing arrangements can be reduced to accommodate new agreements*	*Since this model involves the establishment of an SPV, it is possible that some staff currently engaged in energy-related activities full time could transfer to the SPV. Requires further investigation*

Compliance check



University Hospital of [redacted] NHS Foundation Trust [redacted] *[redacted] will be a shareholder in the SPV as well as an offtaker. Will have role as landlord relating to lease of the plant room from [redacted] to SPV.*	Power to generate or procure heat and electricity supplies	NHS Foundation Trusts (FTs) are a public benefit corporation with the function of providing goods and services for the NHS in England (s30 NHS Act 2006). This means that they are entities which are separate from government and which therefore have more freedom to make decisions about operations. FTs have a general power to 'do anything which appears to it to be necessary or expedient for the purpose of or in connection with its functions' (s47 NHS Act 2006) and this includes entering into contracts (s47(1)). FTs have the financial power to borrow money in connection with its functions (s46(1) NHS Act 2006) although this cannot exceed the limits it has set itself (s46(2) NHS Act 2006). It can invest for purposes connected with its functions (s46(4) NHS Act 2006) which may include forming, participating in, or otherwise acquiring bodies corporate (s46(5) NHS Act 2006). An FT's principal purpose is to provide goods and services for the purpose of health services in England (s43(1) NHS Act 2006). However, FTs are expressly able to carry on activities for the purpose of making additional income available so that it may better carry out its principal purpose (s43(3) NHS Act 2006). In summary, NHS Foundation Trusts appear to have the power to procure and/or generate heat and electricity supplies because of their broad powers to do anything which is necessary or expedient in connection with its functions, including the provision of health services.	Applicable. No issue. Applicable (as shareholder in SPV and offtaker). No issue. Applicable. No issue. Applicable. No issue. Applicable. No issue.
	Constraints on the generation or procurement of heat and electricity supplies	Although FTs have broad powers there are limitations which could impede the generation of heat and/or electricity. Firstly, it must be noted that FTs require a licence and are overseen by NHS Improvement. Therefore, even though FTs are theoretically able to act without the constraints of a public body, FTs will in practice be subject to scrutiny, especially regarding matters such as finance and governance. This has the potential to restrain activities as approval from NHS Improvement may be required, especially where those activities can be seen as more than "business as usual", such as generating electricity rather than purchasing it. As noted above, there are restrictions on an FT's ability to borrow money. This may impact the viability of generating energy as opposed to procuring energy from an external source.	Applicable (as shareholder). No issue. Applicable. No issue [redacted] confident in ability to raise capital).
	Power to supply heat and electricity to third parties (public and/or private sector)	As stated above, FTs are able to carry on activities beyond its healthcare functions to provide additional income (s43(3) NHS Act 2006). It could be envisaged that this would include the supply of heat and electricity to third parties, whether that party is in the public or private sector.	Not applicable as [redacted] will not itself be supplying heat/electricity.

Evaluation process



WOMBLE BOND DICKINSON

Christer Frennfelt

SWEP

CHALLENGE EFFICIENCY

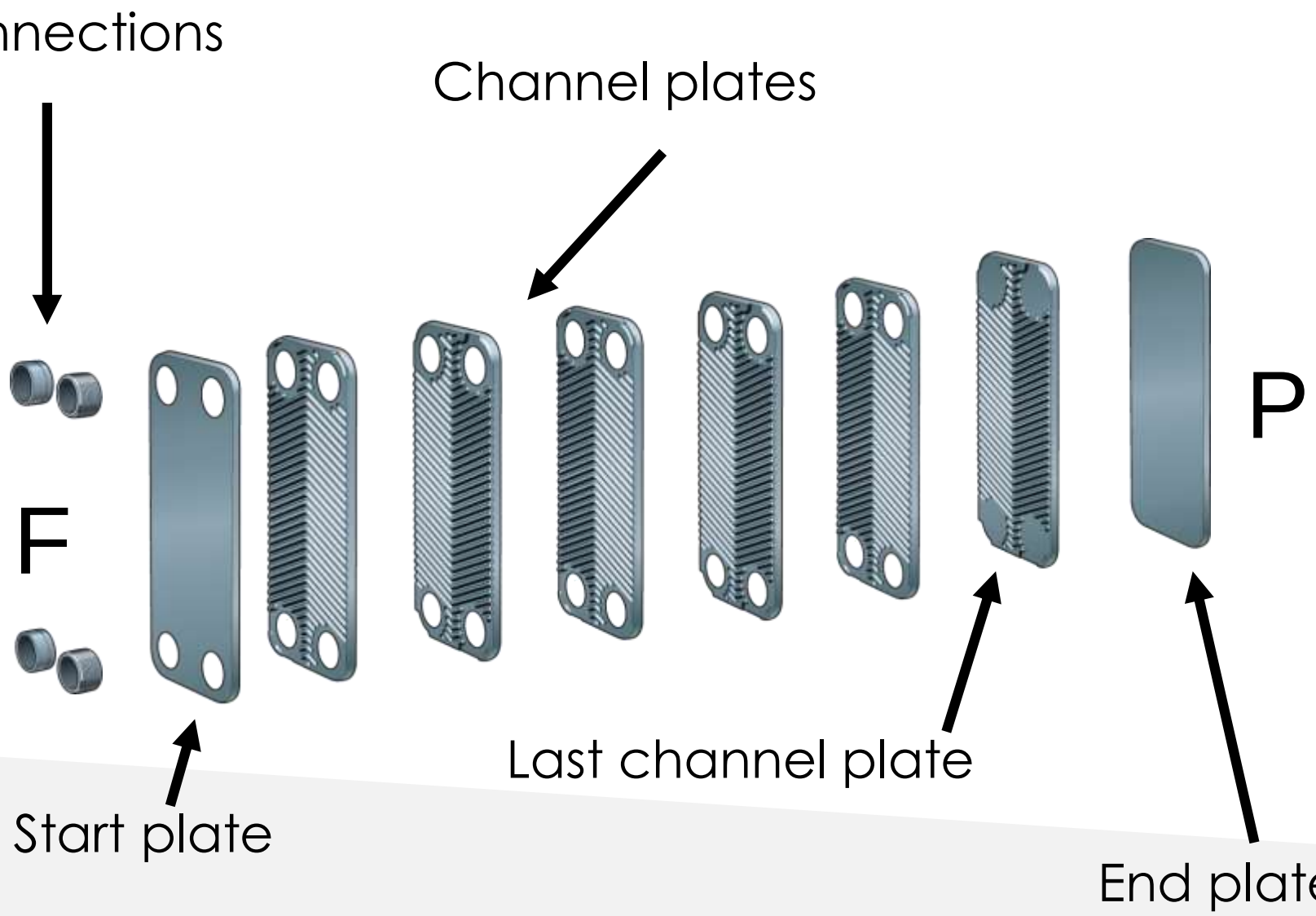
SWEP
A DOVER COMPANY

Taking on the global energy challenge

- Specialized in Brazed Plate Heat Exchangers (BPHEs)
- Founded in 1983
- World-leading manufacturer
- Pioneers in BPHE technology

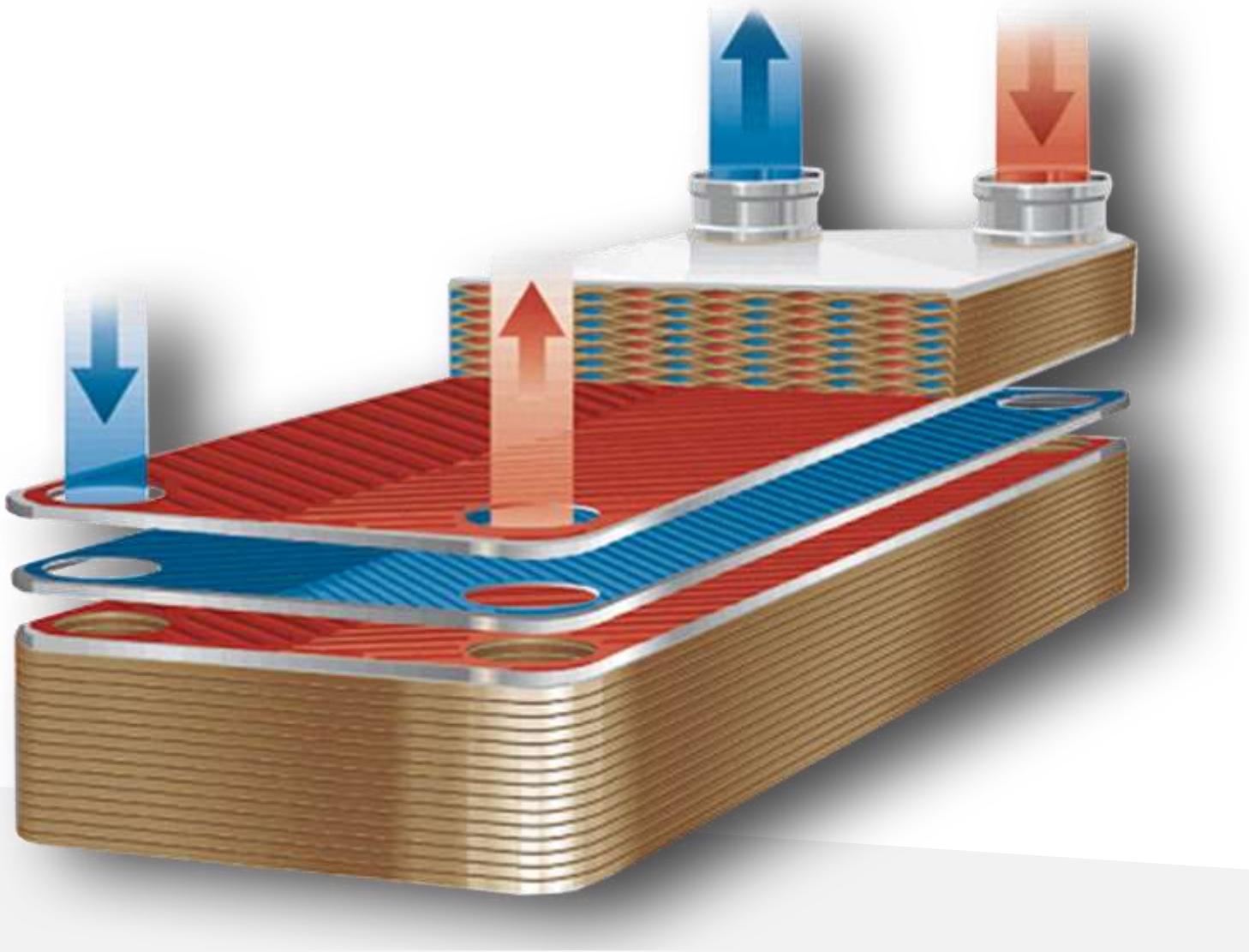
CHALLENGE EFFICIENCY

Basic design of a BPHE

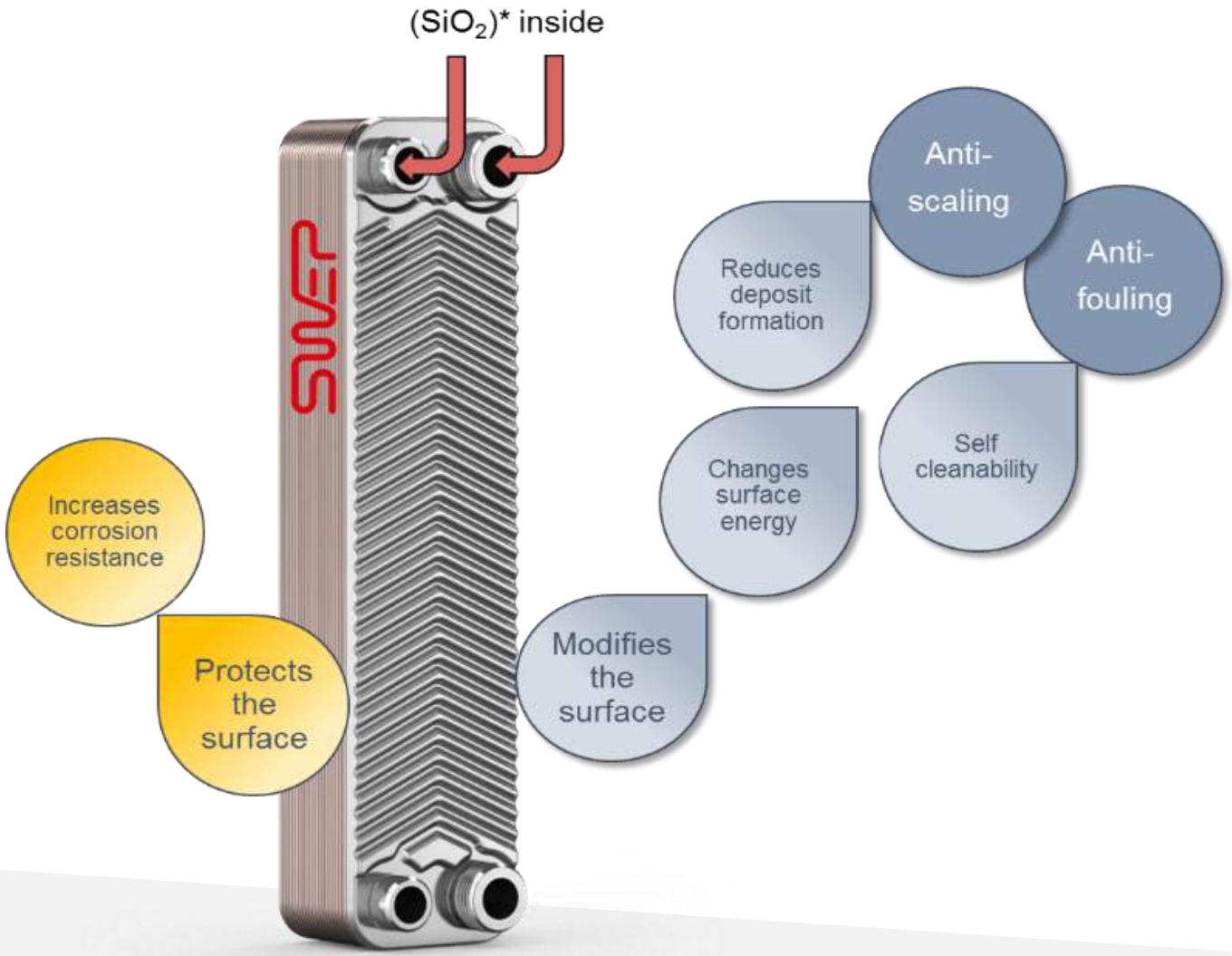


CHALLENGE EFFICIENCY

How a BPHE works



SEALIX®



CHALLENGE EFFICIENCY

Ian Allan

Switch2


switch2
Switch2 Energy
Making a success of community heating

Over 35 years' experience

153 employees

40 engineers

38,000 PAYG customers

Serving **70,000** customers

500 schemes

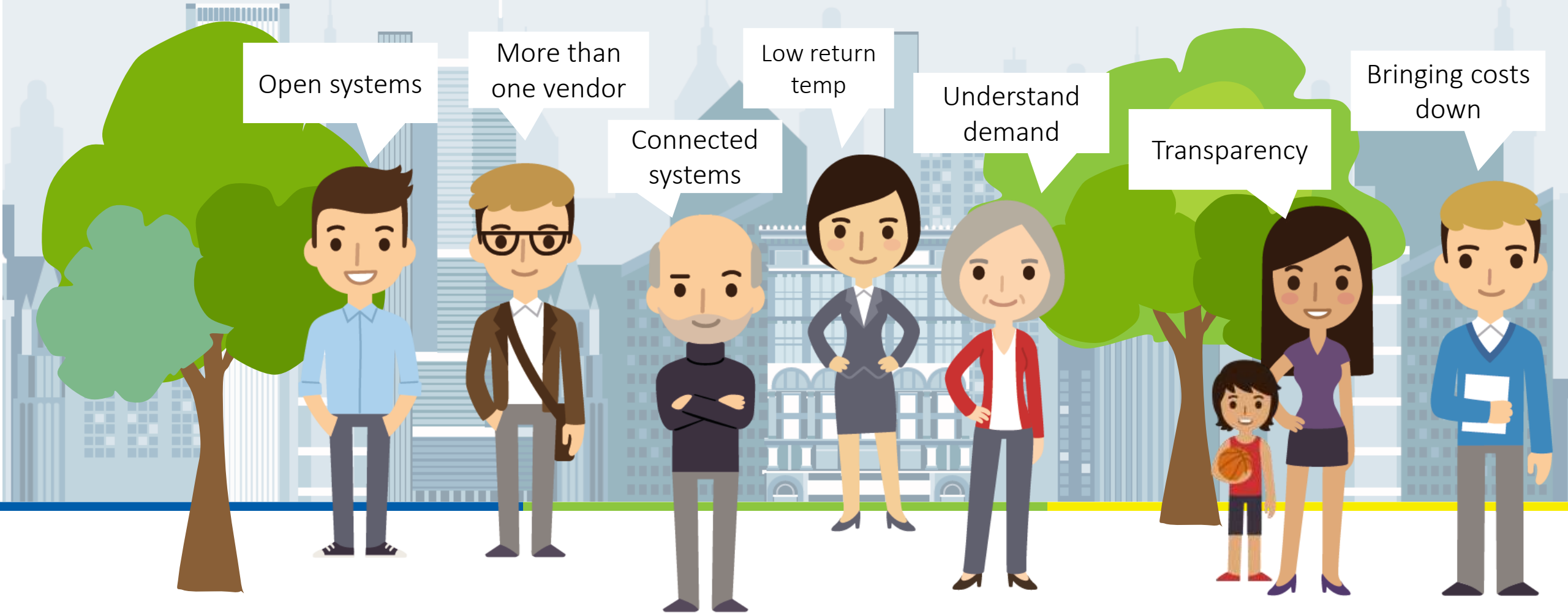
Processing **£16 million** in payments

110 energy centres

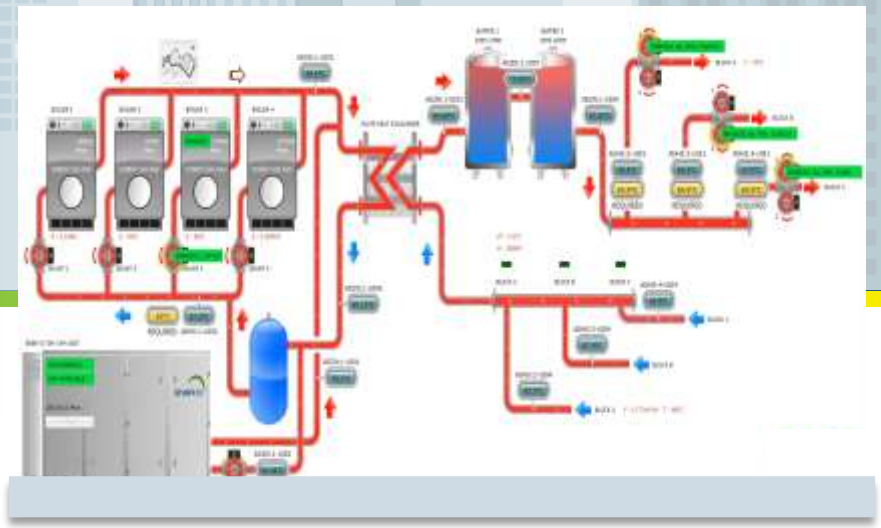
240,000 bills sent annually

What is it all about?

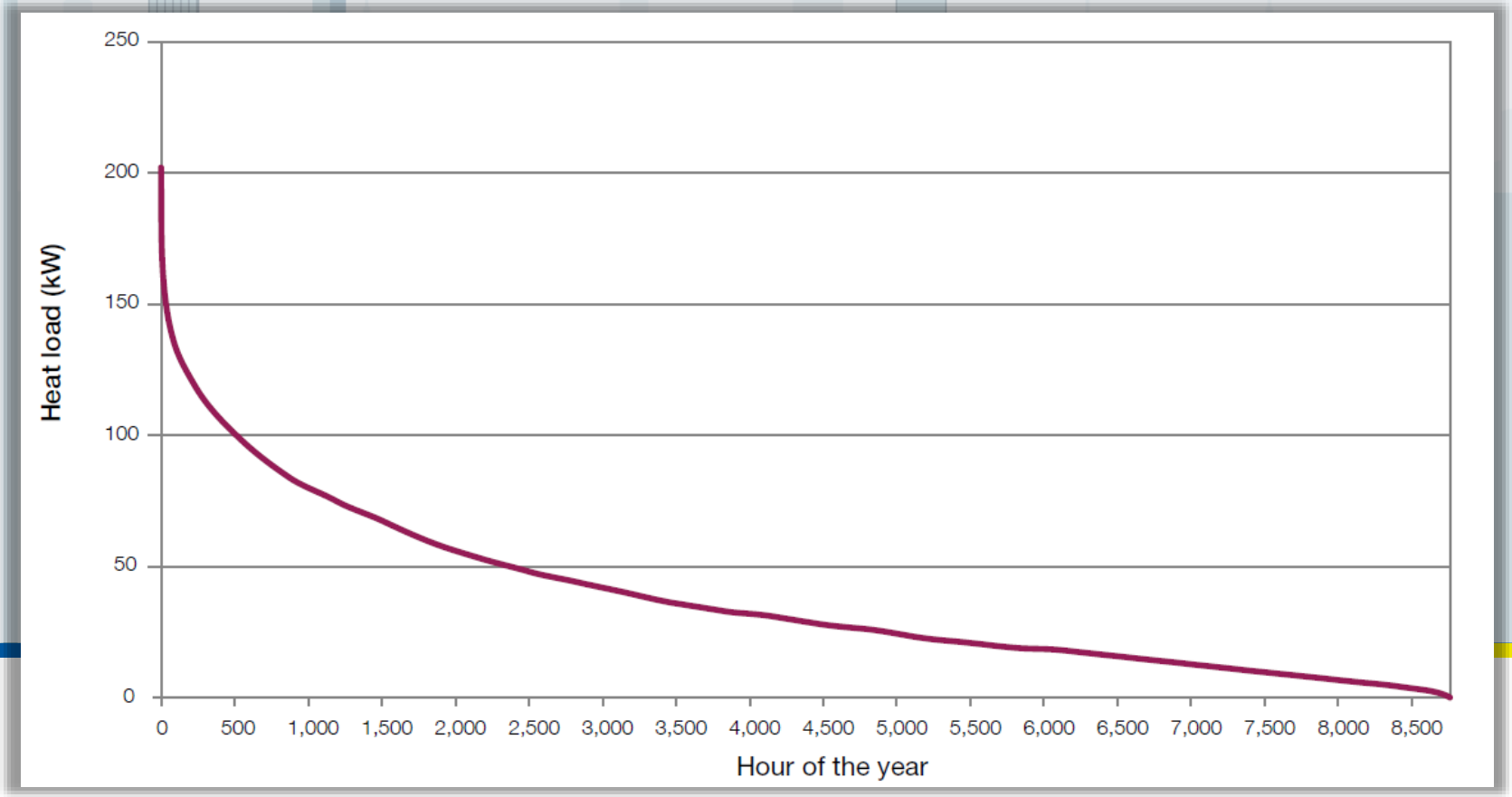
Money and the environment



Switch2 Optimise:
End-to-end operations & Maintenance



Final thoughts: Heat demand curve



Chris Hill

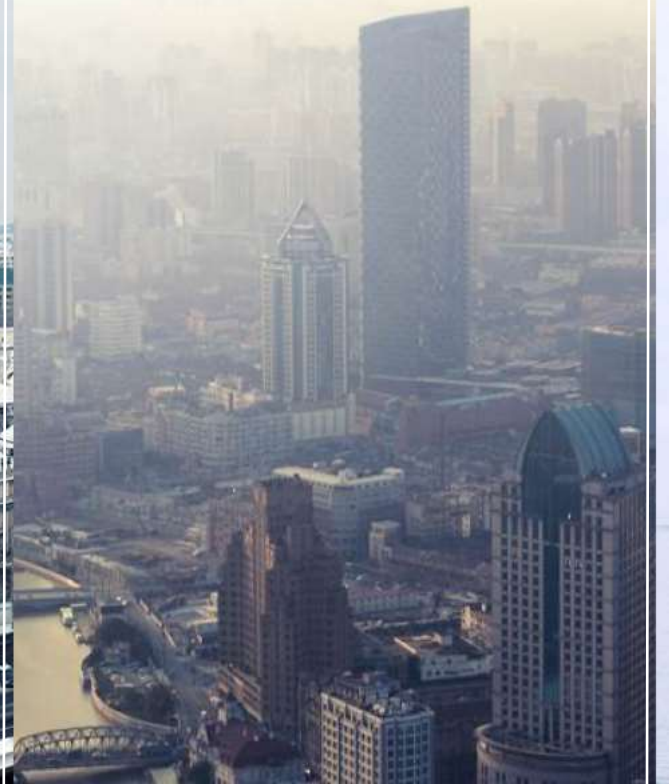
Logstor


LOGSTOR
defining network efficiency
Working in Partnership with LOGSTOR UK

Our business

District Heating

District Cooling



Oil & Gas

Industry

Our Value Proposition

Lowest total cost of operation

- Insulation Technologies
- Lifetime Insulation protection
- Integrated Solutions

Effective installation

- LOGSTOR Joints
- LOGSTOR Design Services
- Documentation & Certification

Longest life time

- Surveillance
- LOGSTOR Calculator
- LOGSTOR Services

Customer Excellence

- Responsiveness
- Transport & Delivery Accuracy
- Accountability

Insulation quality

- A question of OPEX as well as CAPEX

- Minimizing operating expenses with high quality insulation which reduces heat loss in the pipe system
- Insulation value expressed as lambda value is as low as 0.0207 W/mK for flexible systems and 0,0223 W/mK for steel pipe systems

W/mK = Watts per meter –Kelvin or K value

Life time protection of the insulation

- Low heat loss and thereby lower operating costs
- The built in diffusion barrier:
  - prevents ageing of insulation properties
  - reduces heat loss
  - increases energy efficiency
  - ensures stable operating costs

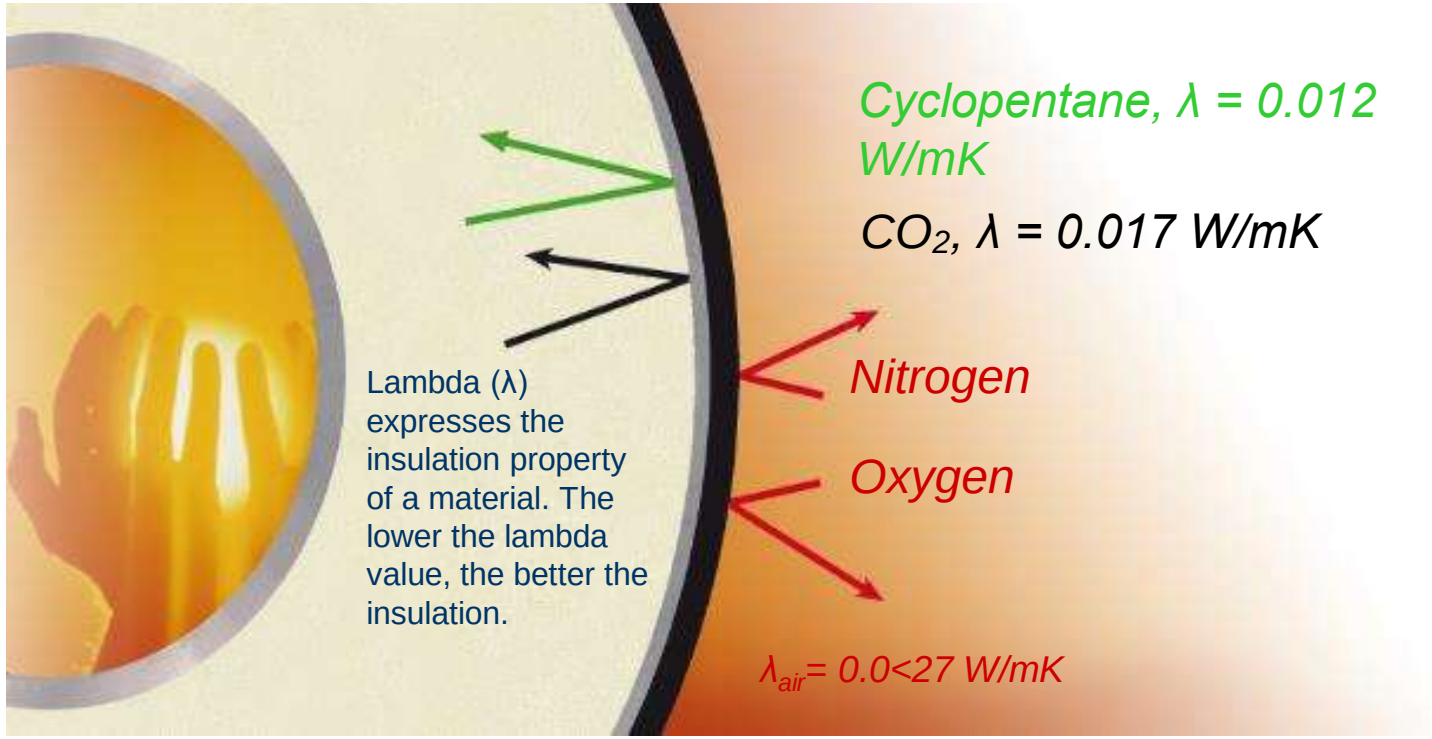
• Diffusion barrier in the complete system incl. pipes, pre-fabricated fittings and joints • For the benefit of the environment – higher energy efficiency equals lower consumption of energy sources

Energy Efficiency / Heat Loss

- Lower operating costs
- Less environmental impact

Our diffusion barrier

- Prevents ageing of insulation
- Reduces energy losses
- Implemented in pipes & joints



LOGSTOR Design Services

- The shortest way from energy plant to consumer
- Optimal design is beneficial in all aspects
- Optimal design means less excavation and reduction of the total investment
- LOGSTOR provides documentation, tools and support to optimize your project

Optimal design

Design manual to find the best solution for the specific project • Tools to calculate all details • Curved pipes to ensure shortest pipe run • TwinPipe to reduce excavation and number of joints

LOGSTOR Calculator

- The tool for correct decision on optimal type of pipe – single, TwinPipe and insulation series
- Optimization in relation to minimizing the heat loss and operational costs, energy efficiency and environmental impact in form of CO2
- Choice of pipe system with lowest total costs of ownership
- Based on the actual parameters for each project
- Comparable calculations for different type of pipes
- Based on the very latest know how about aging of the PUR-insulation foam
- LOGSTOR Design Tool – a new online calculation tool for design of pre-insulated pipe systems

LOGSTOR Calculator

Web based and easy to use tool • Results shown in numerical form and easy-to-read graphs • Aging processes in PUR insulation foam shown in graph form • Any calculation result can be downloaded for your personal use

Monitoring and surveillance

- 24/7 surveillance ensures efficient and flawless heat supply
- Digital monitoring of complete network
- Any leakages or breaks reported instantly, incl. location
- Any changes in parameters registered and preventive repair can be initiated
- Access to all data on any digital platform

LOGSTOR full service solution

Installation and commissioning of complete surveillance system • Hosting of data • Ongoing analysis of data • Monthly status report • Repair service

Conclusion: We take care

- Service in all stages of your project
- Technical support during design, installation and operation
- We provide
  - online support, documentation and calculation tools
  - on-site instructions
  - certified courses for engineers, fitters and supervisors

Our 50 years of accumulated know-how about installation and operation supports the optimal decisions

UK CASE STUDIES

- Commonwealth Games
- Aberdeen Heat & Power
- Greenwich Peninsula
- Glasgow University
- Strathclyde University
- Gateshead Council
- Cambridge University
- Islington Council
- Nottingham Council
- Stoke Council
- Leeds Council
- + many more LA and private projects

Questions?

Chris Hill – UK Managing Director
Logstor UK
Tel: 07788 284884
Email: chr@Logstor.com

Documentation on **logstor.com**

Follow us on **LinkedIn**

Where does your organisation fit?

Low	Risk	High
Low	Complexity	High
Low	Cost of capital	High

Michael Berrington

Grant Thornton

Grant Thornton

An instinct for growth™

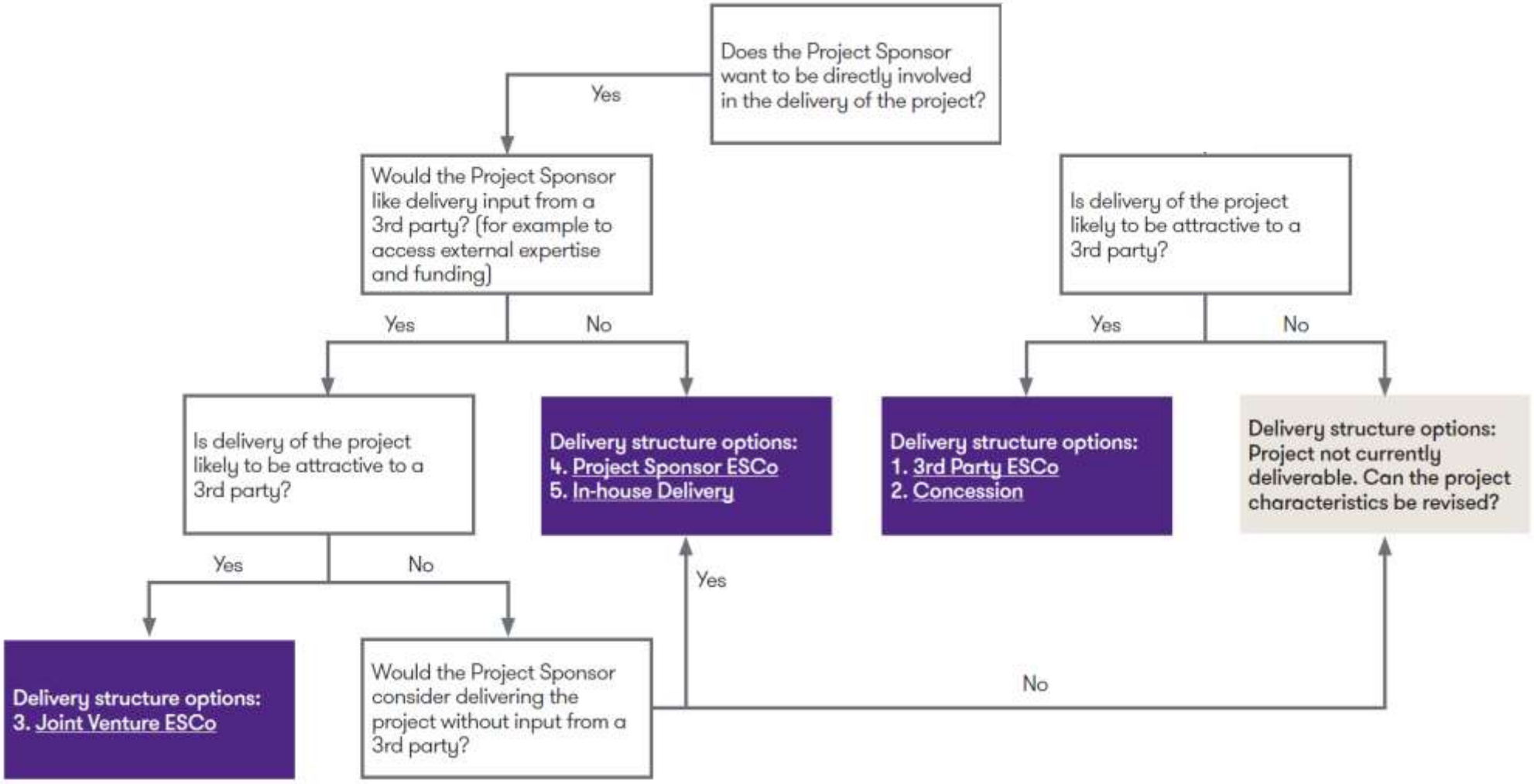
Vanguards Event – GT Handouts

Michael Berrington

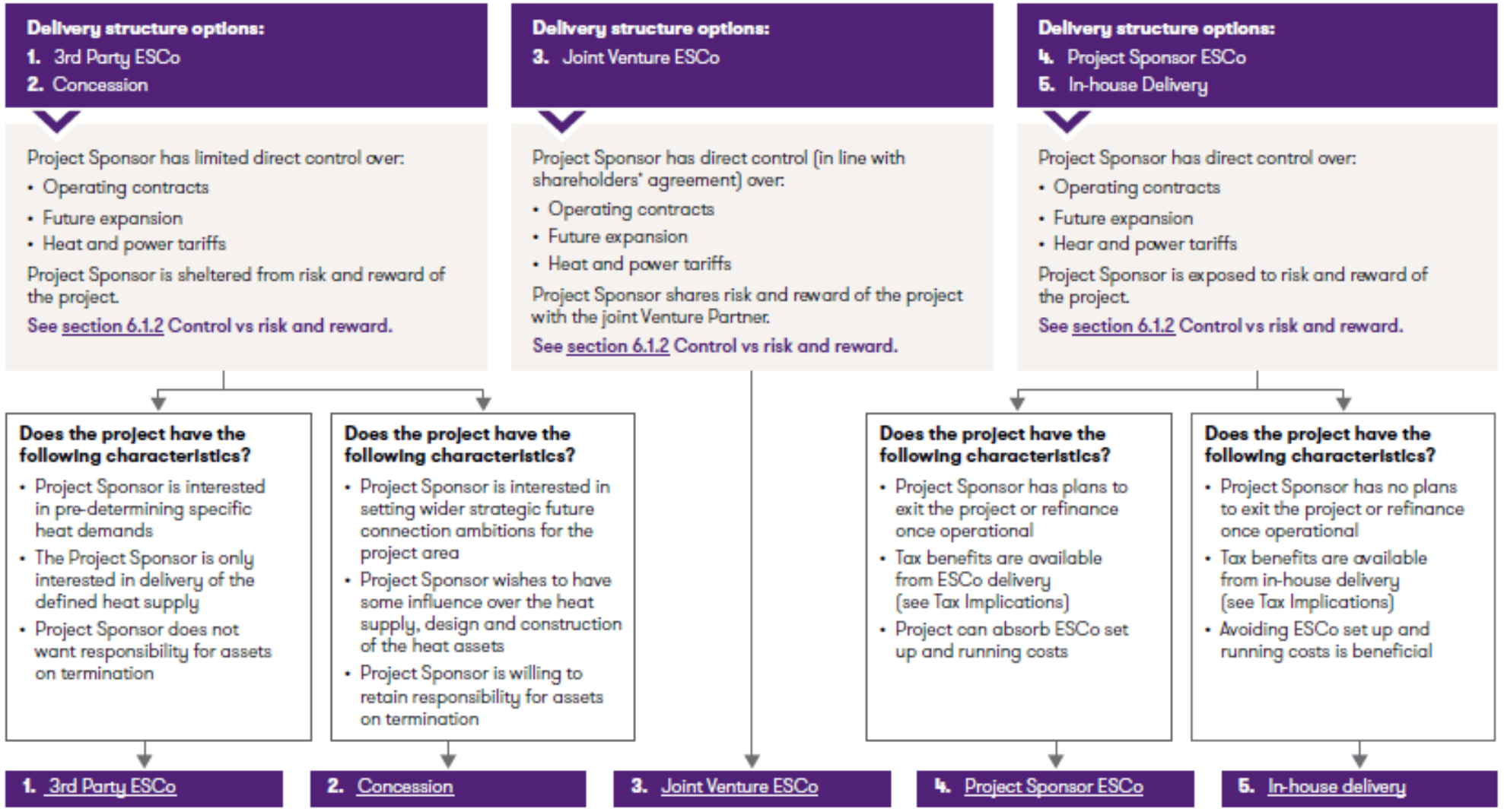
Grant Thornton

4 February 2019

Decision Tree – Delivery Structure Options



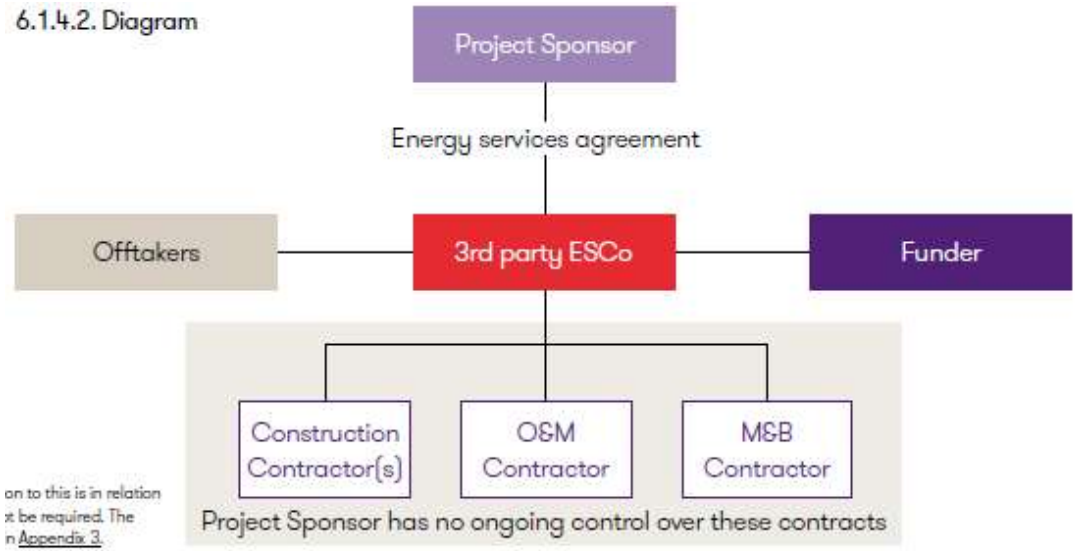
Preferred Delivery Structure



Delivery Structures

3rd Party ESCO

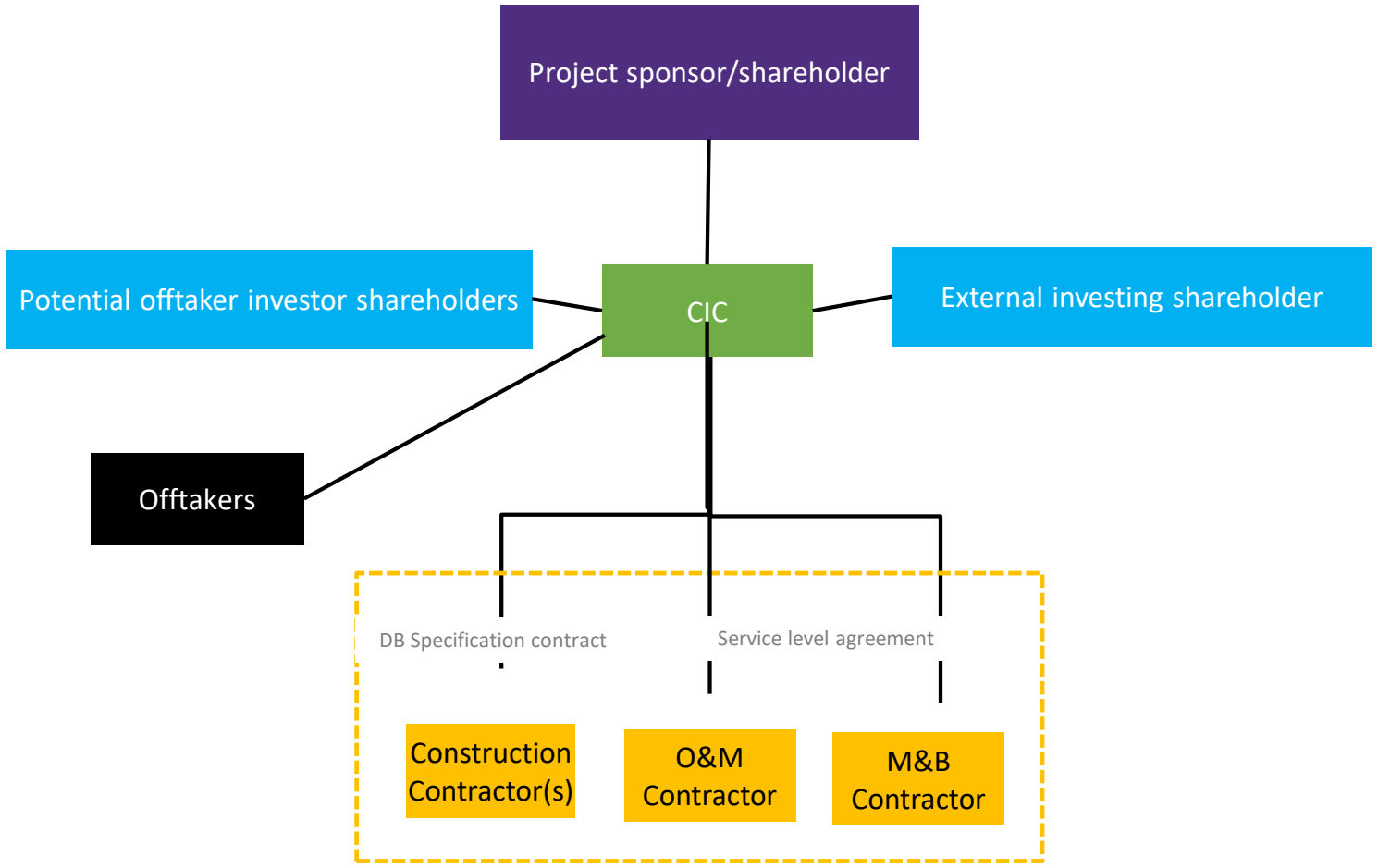
6.1.4.2. Diagram



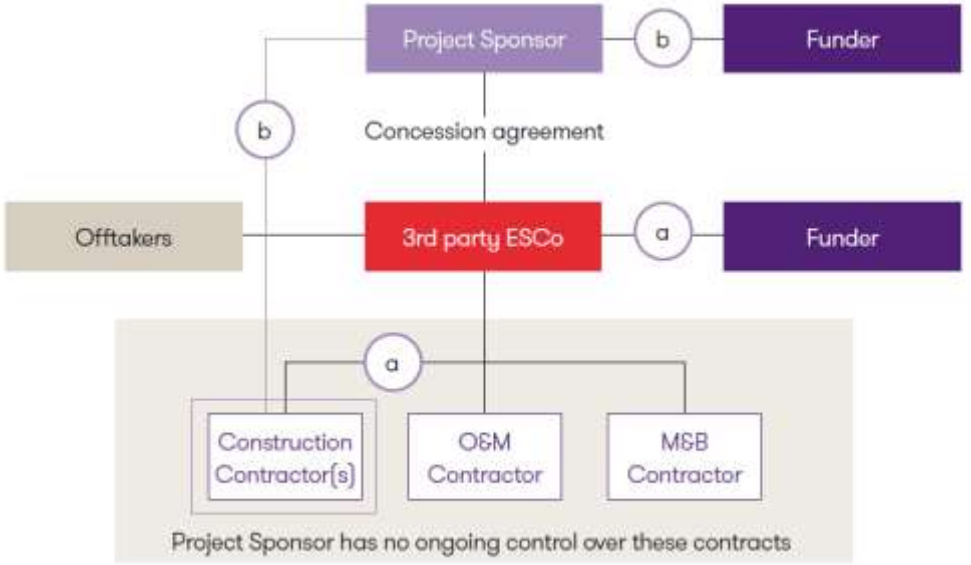
on to this is in relation
t be required. The
n Appendix 3.

Advantages	• allows technical and performance risk to be transferred to a 3rd party. The 3rd party is likely to operate many district heating projects and therefore be well placed to manage these risks • leverages 3rd party expertise and skills • secures external funding
Disadvantages	• the Project Sponsor will have limited control over how the project is delivered. This may make it more challenging for the Project Sponsor to achieve its strategic objectives in relation to the project (e.g. future expansion, setting heat and power tariffs) • project must meet 3rd party's return on investment criteria, which could result in higher heat and power tariffs

Community Interest Company



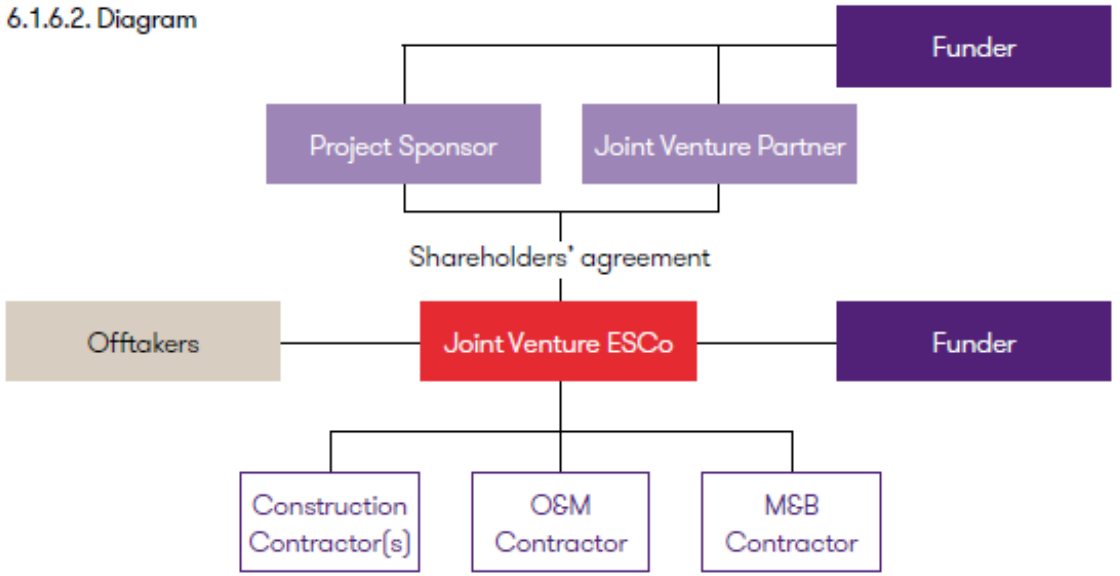
Concession Model



Advantages	• allows technical and performance risk to be transferred to a 3rd party. The 3rd party is likely to operate many district heating projects and therefore be well placed to manage these risks • leverages 3rd party expertise and skills • secures some level of external funding • Project Sponsor is able to influence expansion of the heat services to specific users
Disadvantages	• the Project Sponsor will have limited control over how the project is delivered. This may make it more challenging for the Project Sponsor to achieve its strategic objectives in relation to the project (for example, future expansion, setting heat and power tariffs) • project must meet 3rd party's return on investment criteria, which could result in higher heat and power tariffs • Project Sponsor retains liability for assets

Joint Venture ESCO

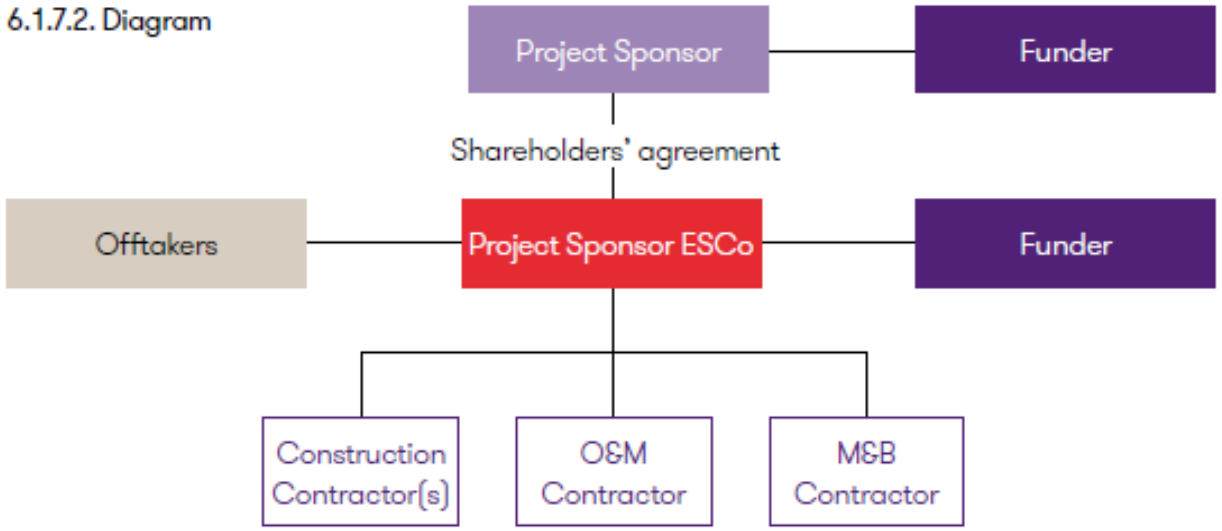
6.1.6.2. Diagram



Advantages	• Project Sponsor retains some strategic control over the project • project risks are shared between the partners • Joint Venture Partner may bring expertise and skills • Joint Venture Partner may bring funding • opportunities to exit the project through sale of shares
Disadvantages	• legal complexity in set up and negotiating the relationship and risk sharing between the partners • the partners will need to agree on the direction of the project (e.g. future expansion, setting heat and power tariffs) • project must meet the Joint Venture Partners' return on investment criteria, which could result in higher heat and power tariffs

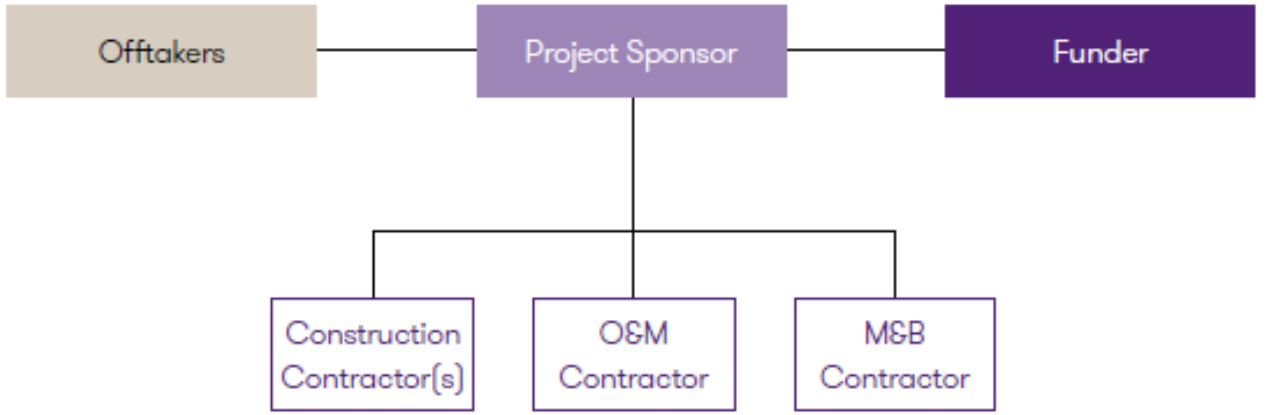
Project Sponsor ESCO

6.1.7.2. Diagram



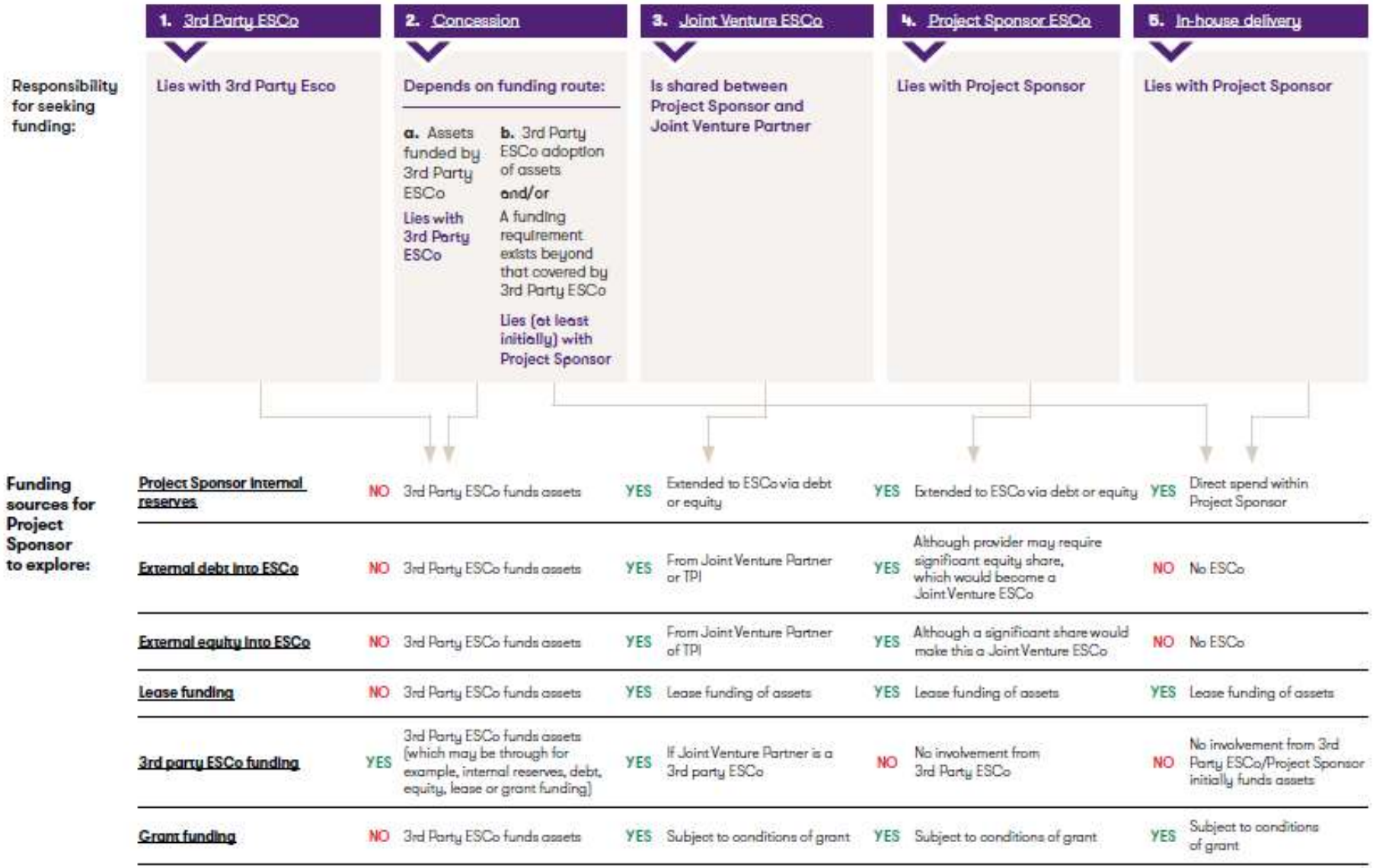
Advantages	• Project Sponsor retains all strategic control over the project (for example future expansion, setting heat and power tariffs) • Opportunities to exit the project through sale of shares and/or refinance project debt
Disadvantages	• Project Sponsor is exposed to all project risks (if not passed down to contractors) • Responsibility for funding/securing funding lies with the Project Sponsor • Drawing on external expertise and skills is limited to contracting arrangements

In-house delivery



Advantages	• Project Sponsor retains all strategic control over the project (for example, future expansion, setting heat and power tariffs) • Costs of establishing and running an ESCo are avoided
Disadvantages	• Project Sponsor is exposed to all project risks (if not passed down to contractors), including limited commercial protection from the liability of the project if it fails • Responsibility for funding/securing funding lies with the Project Sponsor • Drawing on external expertise and skills is limited to contracting arrangements • Opportunities to exit the project are limited • May result in irrecoverable VAT – see Section 9.2.3.

Funding sources to explore



	1. 3rd Party ESCo	2. Concession	3. Joint Venture ESCo	4. Project Sponsor ESCo	5. In-house delivery
Responsibility for seeking funding:	Lies with 3rd Party Esco	Depends on funding route: **a.** Assets funded by 3rd Party ESCo — Lies with 3rd Party ESCo **b.** 3rd Party ESCo adoption of assets **and/or** A funding requirement exists beyond that covered by 3rd Party ESCo — Lies (at least initially) with Project Sponsor	Is shared between Project Sponsor and Joint Venture Partner	Lies with Project Sponsor	Lies with Project Sponsor
Funding sources for Project Sponsor to explore:					
Project Sponsor internal reserves	NO 3rd Party ESCo funds assets	YES Extended to ESCo via debt or equity	YES Extended to ESCo via debt or equity	YES Direct spend within Project Sponsor
External debt into ESCo	NO 3rd Party ESCo funds assets	YES From Joint Venture Partner or TPI	YES Although provider may require significant equity share, which would become a Joint Venture ESCo	NO No ESCo
External equity into ESCo	NO 3rd Party ESCo funds assets	YES From Joint Venture Partner of TPI	YES Although a significant share would make this a Joint Venture ESCo	NO No ESCo
Lease funding	NO 3rd Party ESCo funds assets	YES Lease funding of assets	YES Lease funding of assets	YES Lease funding of assets
3rd party ESCo funding	YES 3rd Party ESCo funds assets (which may be through for example, internal reserves, debt, equity, lease or grant funding)	YES If Joint Venture Partner is a 3rd party ESCo	NO No involvement from 3rd Party ESCo	NO No involvement from 3rd Party ESCo/Project Sponsor initially funds assets
Grant funding	NO 3rd Party ESCo funds assets	YES Subject to conditions of grant	YES Subject to conditions of grant	YES Subject to conditions of grant

Funding Options

- Project Sponsor Internal Reserves
  - Accumulated Profits
  - Prudential Borrowing
  - Corporate Borrowing
  - Soft Loan
- Debt Funding
  - Project Finance
  - Secured Debt
  - Crowdfunding
  - Securitisation of Subsidies
  - Soft Loan
- Equity Funding
- Lease Finance
- Grants

Link to guidance

- https://www.gov.uk/government/collections/heat-networks-guidance-for-developers-and-the-supply-chain

Choosing a structure: theory into practice

Greetings from Leaffield

Part 1:

- Review the models and give them a score based on how well they match the needs of the role you are playing (0 = worst fit; 5 = best fit)
- Sum your group's totals to see which model works best
- Discuss: does it work well for everyone? Why? Why not?

You have 25 minutes and you must make a decision!

Part 2:

Thank you!

Keep in touch!