London Borough of Croydon

Croydon Heat Network

Progress Update

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Appendices

1 Introduction

1.1 Scheme Overview

Arup was appointed by London Borough of Croydon (LBC) to draft the Outline Business Case (OBC) for Croydon's District Energy Scheme (CDES). Arup's scope was focused on the commercial and financial aspects of the scheme, whereas WSP UK was separately appointed to prepare the technical specification, feasibility assessment and techno-economic analysis.

The CDES scheme would use low carbon heat from the Beddington Energy Recovery Facility to supply Croydon's town centre. At full build out, the total heating demand was estimated to be 27 GWh/year. Croydon aimed to exercise its planning powers to support network build-out over time by mandating new developments to connect to the network.

Prior to commencing the commercialisation work, Arup conducted a preliminary assessment (outputs in Appendix A) of the scheme and requested WSP to alter some aspects of the proposed technical solution, such as:

- ERF link – consideration of an alternative network connection route from the ERF through Wandle Park, to enable the network to connect to large commercial heat loads in the vicinity of the new route.
- Energy Centre – omission of the CHP engine and private wire elements, to support the delivery of Croydon's commitment to decarbonising heat.

WSP agreed with our recommendations for the scheme and updated the techno-economic model to reflect the changes. We have replicated these assumptions within the financial model, overlaying high level inflation, tax and accounting, and financing assumptions to test the model.

The results from the techno-economic model reflected a real, pre-tax IRR just below zero based on a 40-year concession. Based on the government Green Book social discount rate of 3.5%, the real pre-tax NPV of 40 years is -£13.8m.

Extract from WSP Techno-economic model:

	25 YEARS	30 YEARS	40 YEARS
NPV	-£16,963,230	-£16,118,856	-£13,771,573
IRR	-4.3%	-3.1%	-0.6%

The above analysis does not account for any of the potential additional loads that were identified as part of Arup's preliminary assessment.

1.2 Aim

The aim of this note is to provide LBC with an update on the progress of the scheme and facilitate future project development once LBC can restart the project.

2 Progress on Commercial Case

2.1 Heat Offtake Price

Arup engaged with Simon Woodward who was representing Sutton Decentralised Energy Network (SDEN) and requested that SDEN update its offer to supply heat from the Beddington ERF to LBC. However, these negotiations were inconclusive and needed more time to reach a mutually agreeable position. Therefore, all modelling reflects WSP's assumptions of the unit price of heat off-take.

2.2 Commercial Structure Workshop

Based on initial discussions, Croydon had earmarked £25m from their regeneration fund to support the development of the network. However, additional funding was required as construction costs were anticipated to be higher than the earmarked amount. With this aspect in mind, Arup explored a few commercialisation options for CDES. In addition, we were also in the process of identifying the appropriate role (s) that LBC could play during the delivery and operation of the scheme. The output of our analysis was meant to be discussed in a workshop. Our presentation and analysis are included in Appendix B.

2.3 Other Considerations

No preferred model or roles were selected by LBC. LBC should select a model that is aligned with the borough's risk appetite, control requirement and resource availability.

Next, where a council/government owned vehicle is being considered, the implications of state aid should be carefully considered, both in relation to the investment in the project and the pricing of the heat in the market:

- *Investment:* If the investment is carried out on sub-market terms (grant) then this could potentially be considered state aid if it supplies the private market and enables the operation of a network that would otherwise be unviable in normal market conditions
- *Heat Pricing:* The payment required to support the feasibility of this network will be driven by the investment and costs required to design, build, operate and maintain the network. This could mean that the prices required to support a commercial proposition for this project may be higher than the anticipated market price.

Additional analysis will be required to understand whether elements of investment and pricing do constitute state aid, and/or whether they fall within the *de minimis* amounts, or whether further thought will be required to comply with state aid rules. It is also noted that in light of the UK's departure from the EU, state aid rules may change over time which could affect LBC's position at the time the project is re-started. In any case legal advice should be obtained in relation to these matters.

Furthermore, LBC should also consider providing/obtaining heat demand guarantees to provide revenue certainty to future funders as this will change the risk profile of the project and facilitate the infusion of cheaper debt in CDES.

Finally, the Government's commitment in the Energy White Paper to support the development of heat network zones may substantially affect the commercial approach, price assumptions and procurement process for the CDES. A public consultation is expected in spring 2021. LBC should monitor this policy development process.

3 Progress on Financial Case

3.1 Financial Model & Assumptions

Arup developed a draft financial model to support future analysis and to assess the commercial terms and financial viability for the project. The model has been developed such that it can test multiple commercial and financial structures (including Council owned, JV or DBFMO and incorporating a mixture of grant, debt and equity).

All our assumptions have been tabulated in Appendix C and the financial model structure and model is appended in Appendix D. The model itself has been issued separately in a MS Excel sheet titled "*07122020 Croydon Financial Model_DRAFT*".

3.2 Other Considerations

Following further definition of the commercial structure, LBC will need to analyse how the structures could impact on Croydon's balance sheet and P&L account in addition to analysing the impact of key risks and defining the anticipated funding sources, both for the project itself and for resource to procure expected required services.

The model has been developed so that multiple funding sources could be used and layered to develop the preferred solution. This could incorporate grants, equity and shareholder debt (either public or private), PWLB, HNIP/GHNF or private debt lending. For each source of funding, LBC would need to further understand the funding requirements, and documentation required to secure such funding.

Appendix A – Preliminary Assessment

Croydon District Energy Scheme

Project Overview & Progress

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Agenda

- Overarching Objectives
- Task 1: Remodelling
- Task 2: Demand Assessment
- Task 3: Tariff Review
- Task 4: Funding Options
- Next Steps

Objectives

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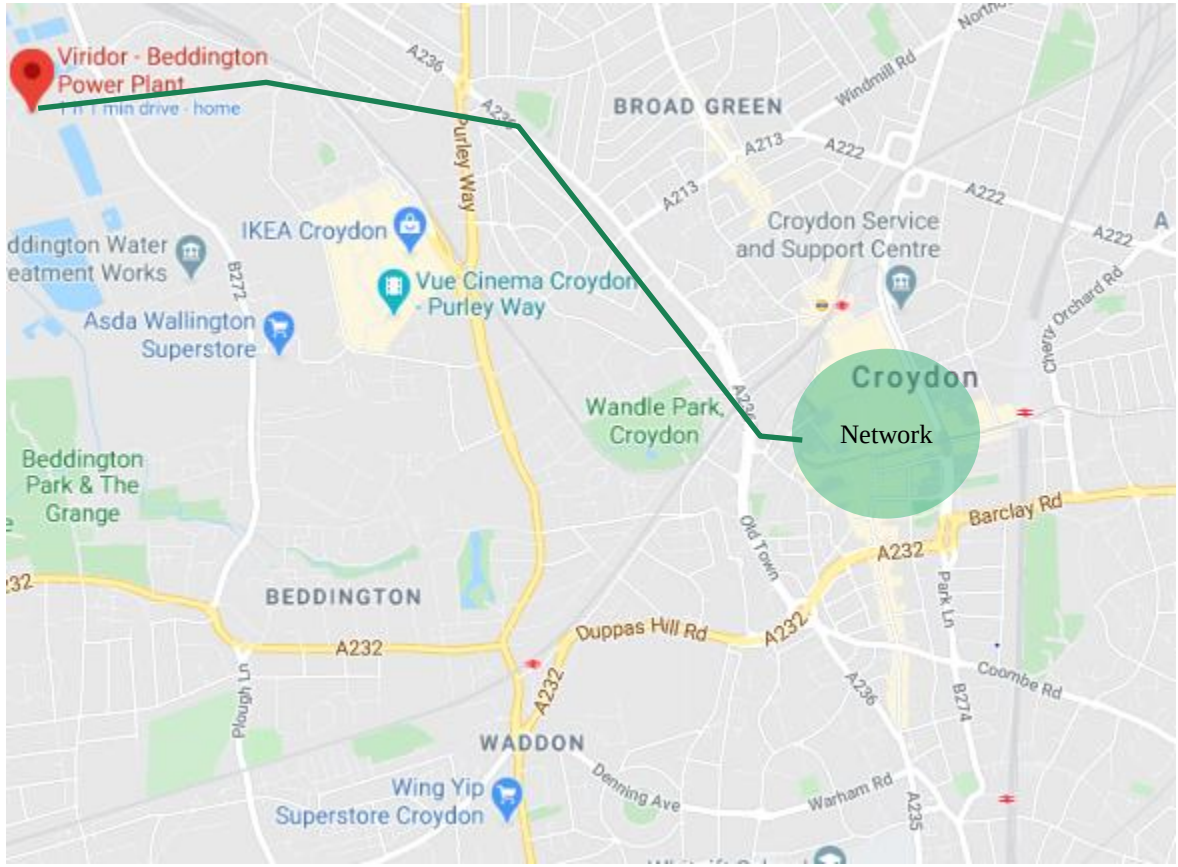
Overarching Objectives

1. Build a viable scheme
   - Viability in relation with:
     - Carbon reduction potential
     - Cost and revenue optimisation
     - High Social NPV
2. Develop a scheme that is fundable
   - Maximise NPV & IRR
   - Make 40 year NPV zero - HNIP
3. Investigate funding options
   - Government Funding
   - Private sector
   - Off-balance sheet financing – ERF Link



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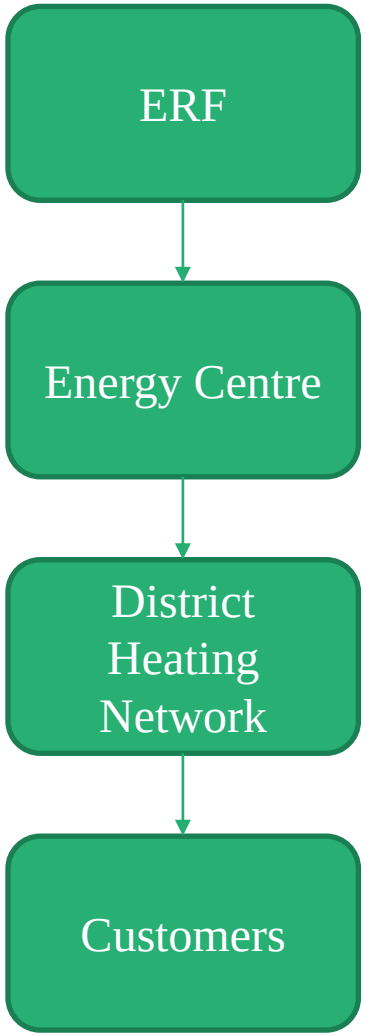
Overarching Objectives

Commercial Viability – The Scheme

- This Project is currently unviable with a £-12.8m base case NPV over 40 years, based on a 3.5% discount rate.
- Total investment for the scheme is £32.9m.
- This includes revenues and costs for the whole project including the ERF link, energy centre and heat network.
- Potential to ringfence assets and procure and fund as individual projects, however this will not provide additional demand or revenues to the scheme.
- If the NPV for the ringfenced asset is increased to make it viable, this will most likely be at the detriment to the rest of the scheme. The NPV across the whole scheme will stay similar.



Task 1 - Remodelling

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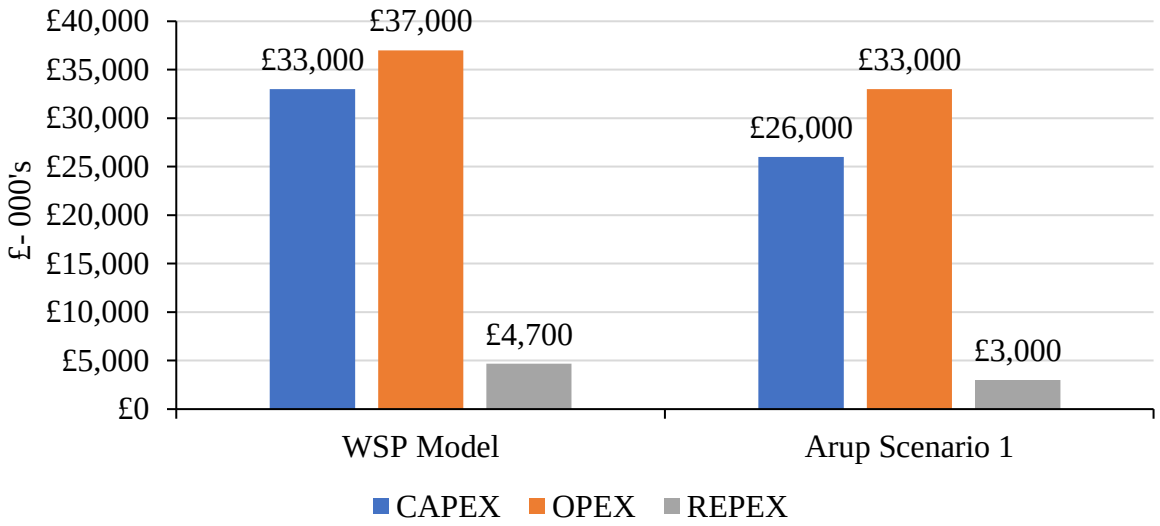
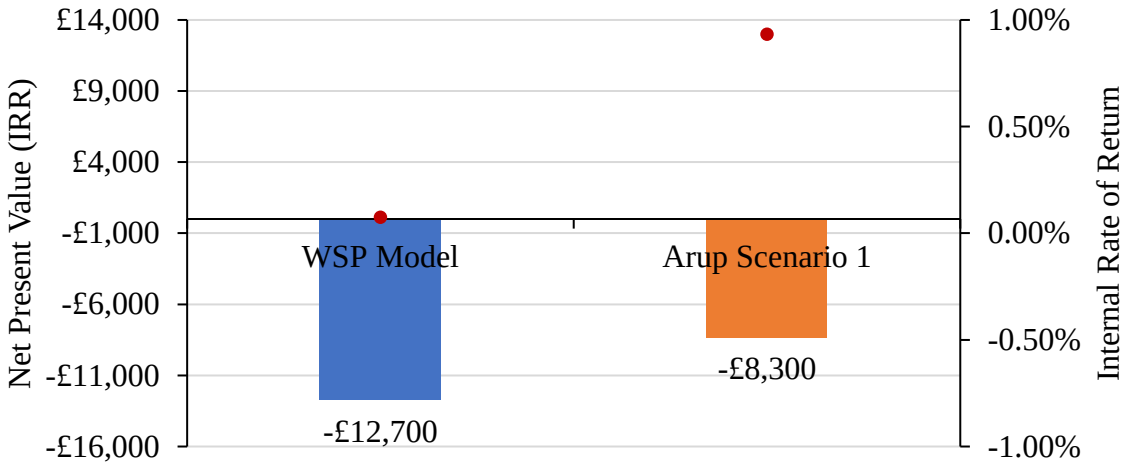
Task 1: Remodelling

- Scenario 1 - Uses gas boilers to replace CHP output
- No additional demand included
- Capex change: - 20%
- Opex change: - 9%
- Repex change: - 35%



Change to over all costs and their breakdown

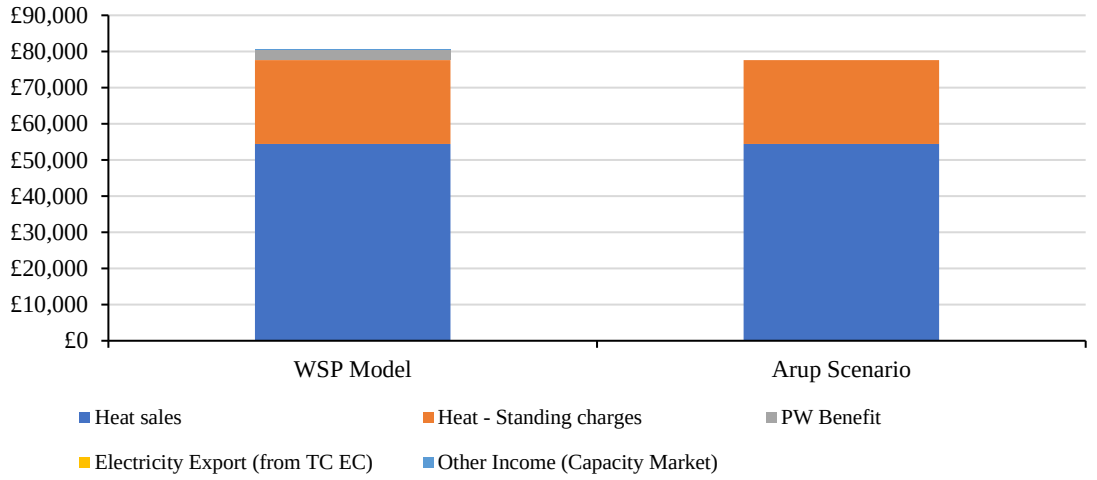


Change to scheme economic metrics over a 40 year period

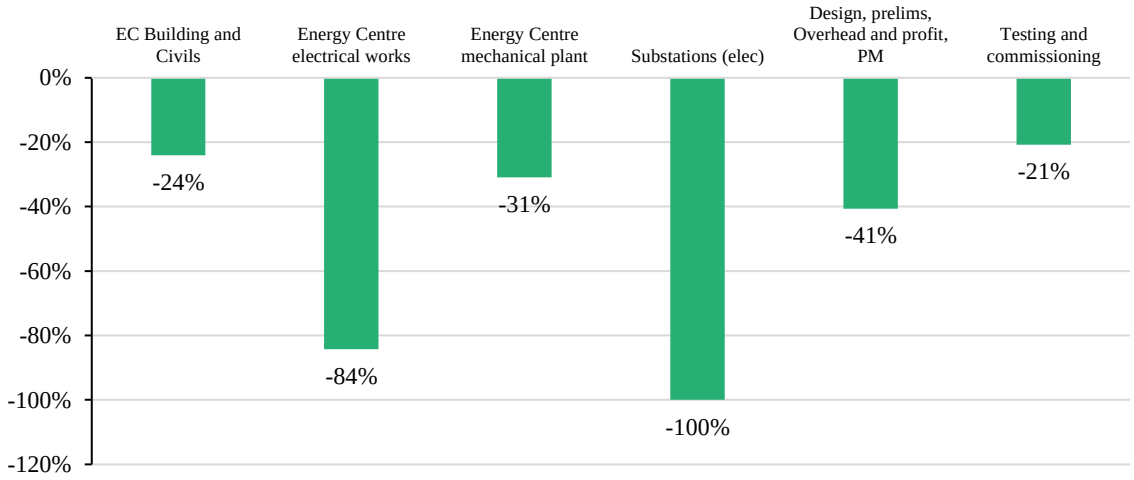
Task 1: Remodelling

- Major capex changes:
  - Electrical substations
  - PW removal
  - Flues – may require study
  - CHP removal
  - Smaller EC shell
- All based on estimates
- Revenue change: - 4%
  - Due to omission of electricity sales

Recommendation: Remove CHP from the base case of the scheme



Revenue comparison



Change to various CAPEX categories

Task 2 – Demand Assessment

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Task 2: Demand Assessment

- What is the amount of additional demand required to make the 40 year NPV zero?
- Variable demand based on scenario
- Scenario 1 - demand is fed through gas boilers
  - C.11,000 MWh/ year additional required
  - 4 MW of additional peak required
- Scenario 2 – demand is fed through EFW
  - C.8,600 MWh/ year additional required
  - 3 MW of additional peak required
- C.13,300 MWh/ year additional identified
- 5 MW of additional peak identified

Additional demands identified using London Heat Map

Task 2: Demand Assessment

- Current ERF link as costed
- WSP: route is deliverable with appropriate confidence
- Not in close proximity to the demands identified
- Alternative route required and will need to be revaluated for deliverability and costs

Pipe route for ERF Link as costed

Task 2: Demand Assessment

- Alternate route suggested by WSP
- Close to identified existing demands and future demands along Purely Way
- Potential cost synergies with proposed UKPN EHV reinforcement route
- UKPN EHV route shown in orange

Recommendation– Revaluate new route for ERF link and engage additional customers

Alternative Pipe route for ERF Link and potential demand locations

Task 3 – Tariff Review

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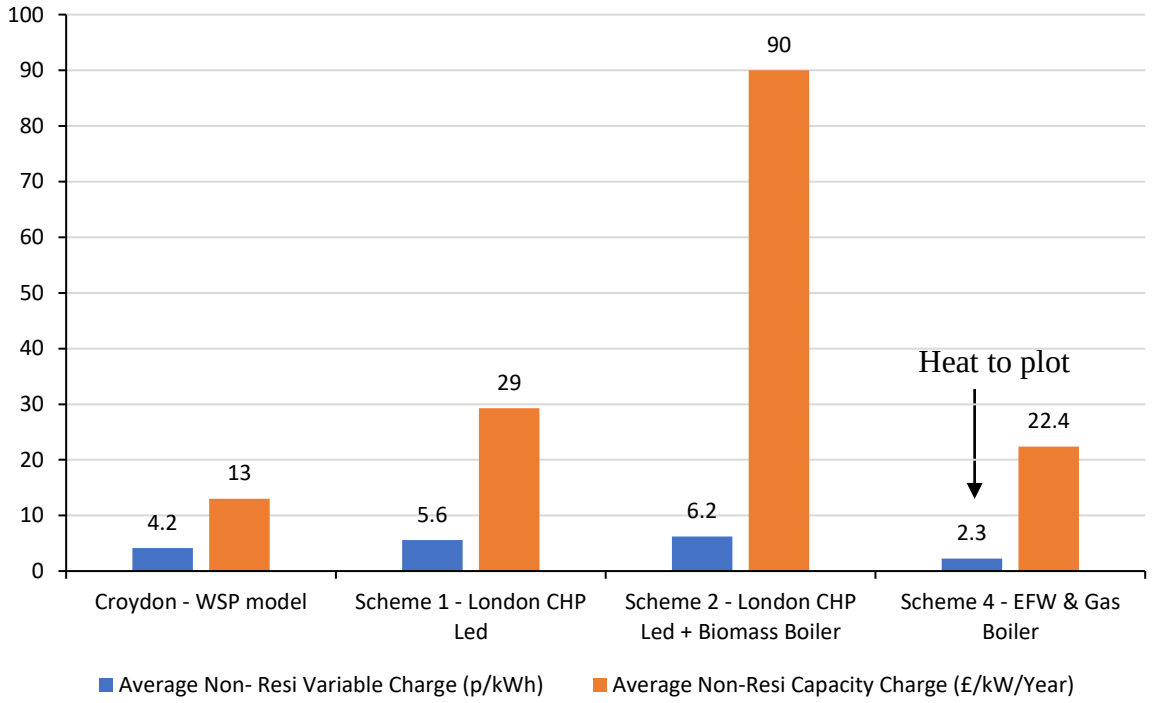
Task 3: Tariff Review

Key message – Clarify capacity charge rate, engage SDEN and negotiate ERF heat price

Wider question – What should be the price of very low carbon heat for businesses?



Variable and capacity charge comparison with market

Task 4 – Funding Options

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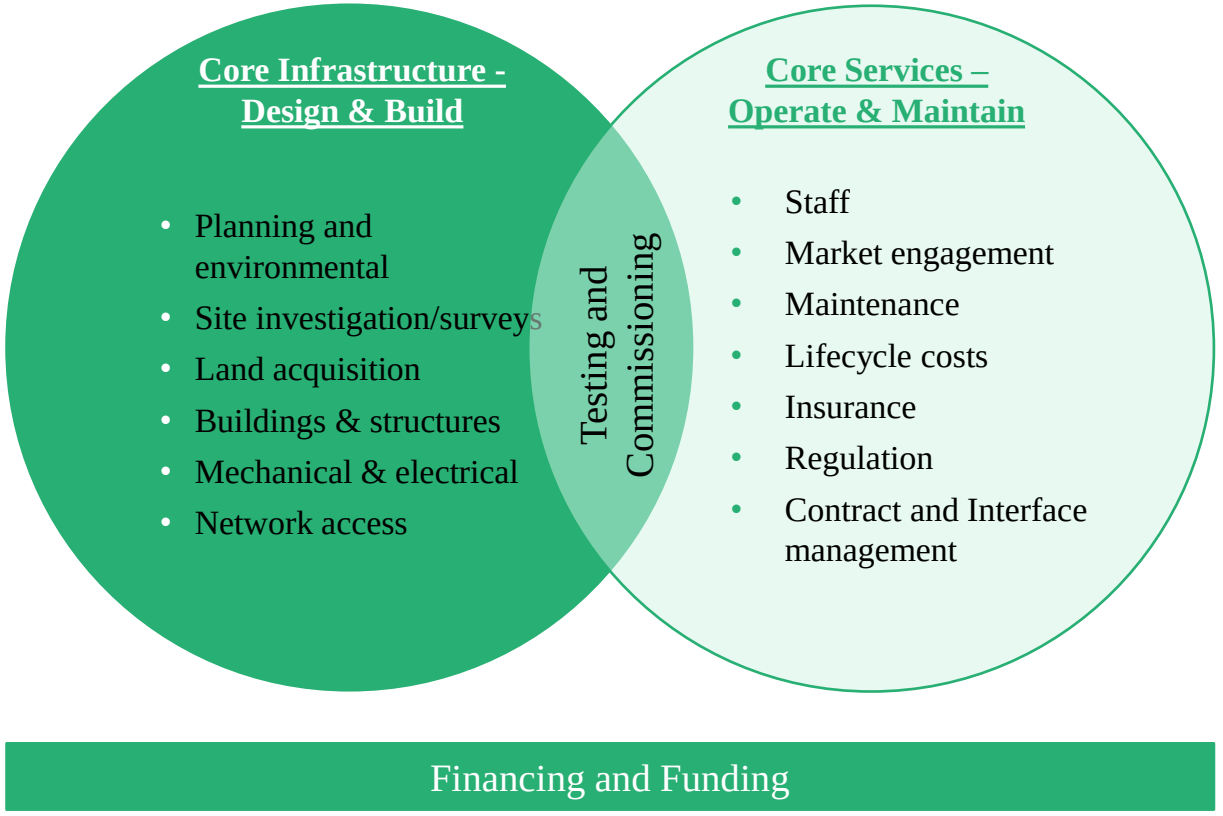
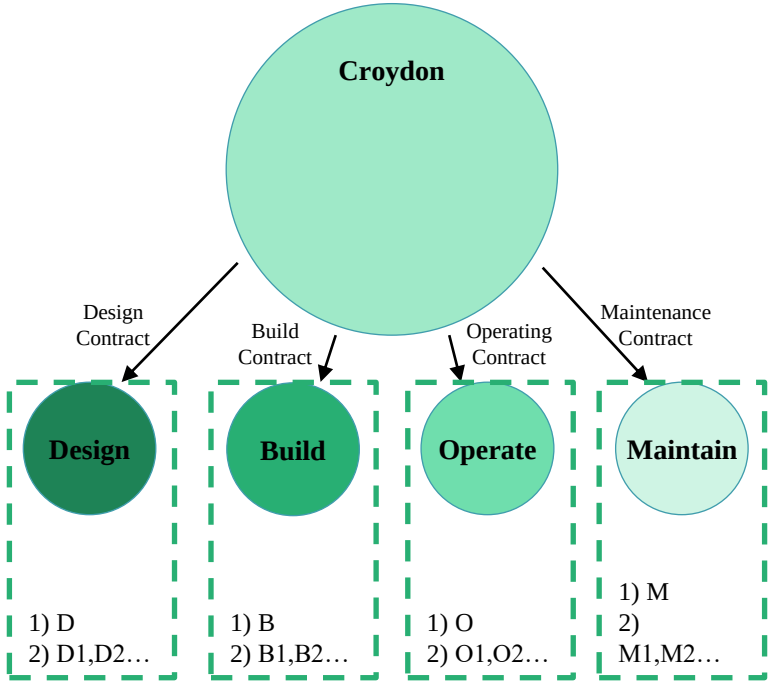
Task 4: Funding Options

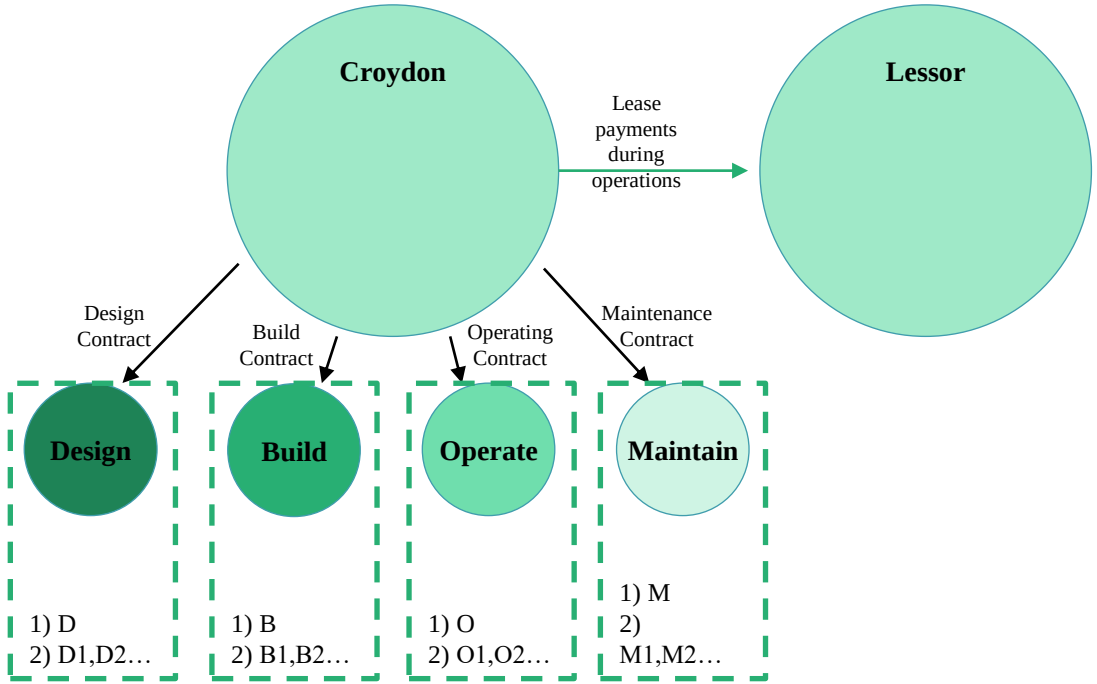


Task 4: Funding Options

Government Funding - Structure



Sale and Lease Back - Structure



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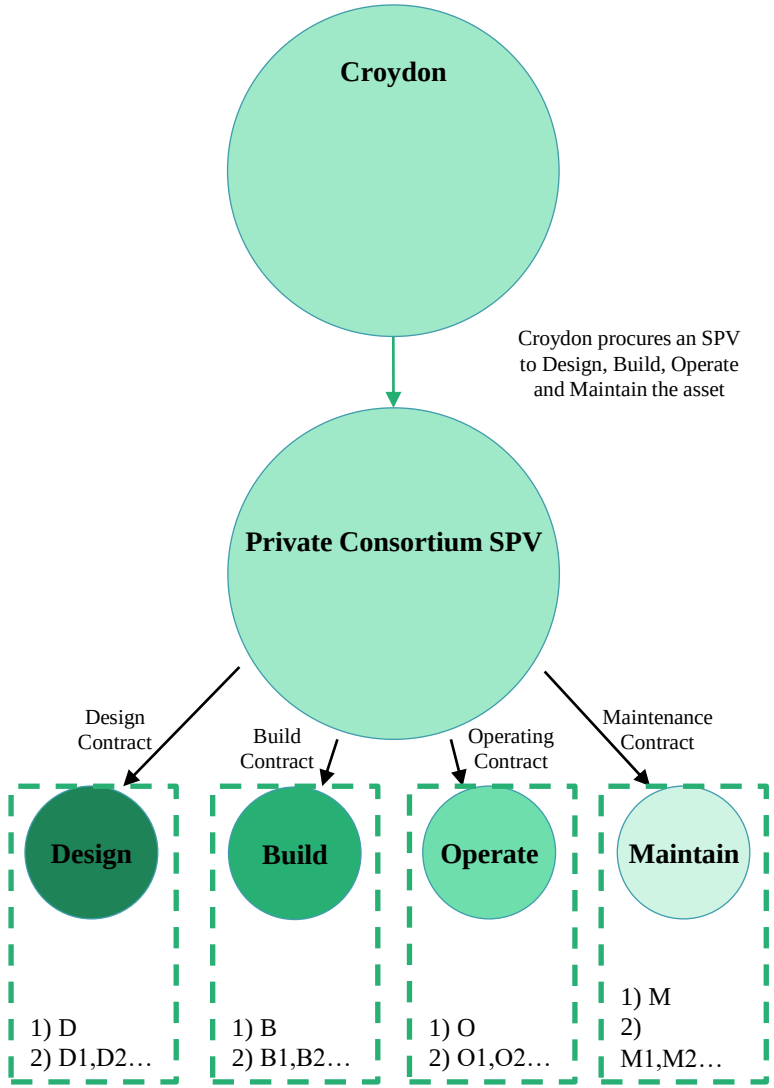
Task 4: Funding Options

Off-balance Sheet Financing - Structure

- This option assumes that Croydon procures a private consortium to design, build, finance, operate and maintain the scheme.
- Croydon is responsible for procuring the consortium, but the consortium will be responsible for the designs, build, operations and maintenance of the scheme.
- The private consortium would be responsible for managing the risks in the scheme including risks such as construction delay and demand risk.
- The SPV would own the asset during construction and operations, but ownership would transfer back to Croydon following the end of the concession.



Task 4: Funding Options

- Given the size of the project we would recommend keeping the project as one SPV and not ringfencing the ERF.
- The commercial model may need to be adjusted depending on the level and sources of funding available for the project.
- We have reviewed three different options that could potentially be used for the scheme.

Consideration	Government Funding	Sale and Leaseback	Off-balance sheet funding
Scope for risk transfer	✓	✓✓	✓✓✓
Cost and Revenue exposure	✓✓✓	✓✓✓	✓
Retained flexibility	✓✓✓	✓✓	✓
Retained control	✓✓✓	✓✓	✓

Next Steps

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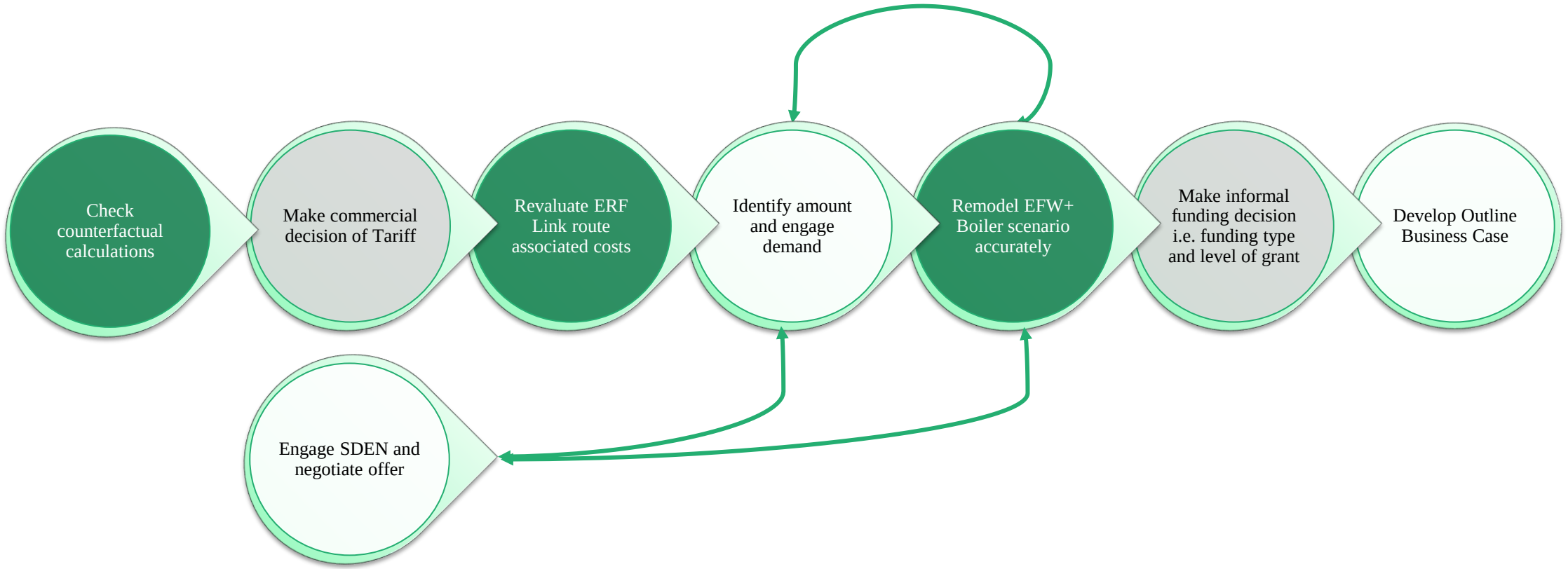
Next Steps


Check counterfactual calculations
Make commercial decision of Tariff
Revaluate ERF Link route associated costs
Identify amount and engage demand
Remodel EFW+ Boiler scenario accurately
Make informal funding decision i.e. funding type and level of grant
Develop Outline Business Case
Engage SDEN and negotiate offer
Action for LBC
Action for WSP/Arup

Appendix B – Commercialisation Workshop

Croydon District Energy Scheme

Project Roles & Delivery Model Workshop

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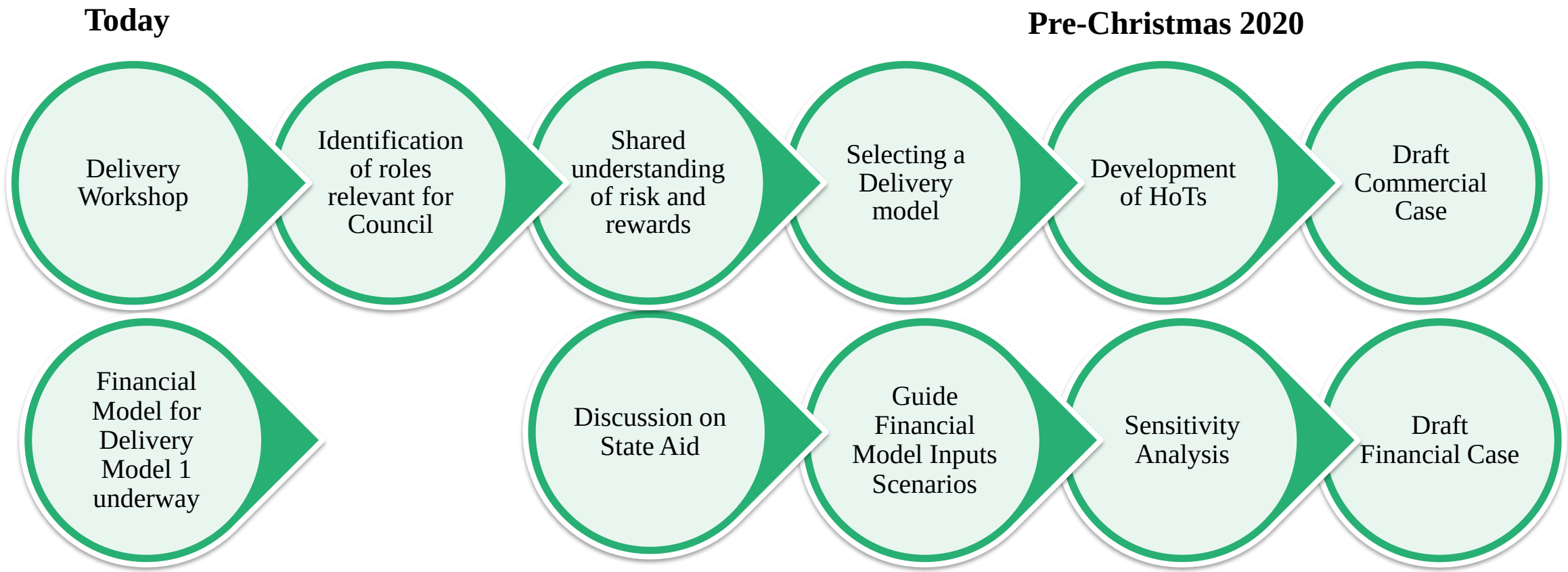
Agenda

1. Rationale for exercise
2. Roles, Responsibilities, Risks & Rewards
3. Delivery Models
4. Discussion

Rationale for exercise



Obstacles & Opportunities

Obstacle	Issue	Opportunity/ Workaround
LBC under-engagement	No champion within LBC. Unclear management motives	-
Connecting to EfW	backlash from lobby groups - negative publicity,	Support LBC in framing the problem for Non-Market Actors
Uncertain demand	LBC not ready to engage under current scenario to develop Letter of Support	Use 100% assumption for OBC and caveat risk
Uncertain heat off take price	LBC havent engaged with SDEN to negotiate heat offtake agreement	Use previous SDEN offer for OBC
Excessive state aid	LBC may already have reached state aid limit	Alternate funding form market

Roles, Responsibilities, Risks & Rewards

Role	Responsibilities	Risks	Rewards
Promoter	✓ Defining physical nature of the project. ✓ Commissioning detailed studies to establish viability ✓ Defining the scale and timing of demand for services. ✓ Publicising the opportunity and communicating the benefits to key stakeholders. ✓ Attracting developers, investors, operators and customers.	✓ Uncertainty around the timing and scale of the project ✓ Any pre-development costs ✓ Changes in regulation/policy support	✓ Project implementation ✓ Achievement of strategic objectives if project gets implemented
Customer	• Agreeing terms of energy purchase agreement/ demand reduction equipment lease-purchase agreements (e.g. price formula, service levels, carbon intensity). • Paying an agreed price for the service.	✓ Quality of heat – heat quality may not be up to the standards the customer is used to ✓ Availability of heat – heat supply may be interrupted ✓ High heat tariff – the customer may end up paying higher bills	• Potentially lower heating bill, for networks registered with the Heat Trust • Security of supply – contractual mechanisms strive to provide alternative sources of heat for customers during interruptions. • Low carbon heat – increasingly becoming a criteria for bulk heat customers
Governance	✓ Assigning roles and responsibilities. ✓ Setting overall direction, ethics policy and objectives for the elements of the programme within the remit of the governing body. ✓ Taking high level commercial decisions. ✓ Monitoring programme performance standards.	✓ Stakeholder management ✓ Changes in regulation/policy support ✓ Project structuring	✓ Good governance ✓ Clear organisational structure and division of responsibilities

Roles, Responsibilities, Risks & Rewards

Role	Responsibilities	Risks	Rewards
Funder	✓ Providing funding or arranging sources of finance, if satisfied that the scheme represents an acceptable risk. • Signing funding agreements, depending on the type of funds being provided (e.g. debt or equity). • Obtaining appropriate security from the beneficiaries of funding.	• Scheme does not preform financially as expected ✓ Demand risk ✓ Regulatory risk	• Financial gain in line or in excess of return requirement
Asset Owner	• Securing an income stream to match its responsibilities and to cover its risks. • Insuring or procuring insurance for the assets. • Ensuring the assets are maintained and components replaced when life expired. • Contracting with installers, maintenance providers, and service companies.	• Contractual risks, arising from the use of the asset for its particular purpose	• Remuneration for use of asset
Property Developer	• Delivering the completed site, including secondary and tertiary networks/assets. • In some projects, making financial or in kind contributions to the network/asset delivery body. • Demonstrating to purchasers or tenants of units on the Development that the network has suitable governance structures, acceptable contract terms and continuity of Energy/service supply.	• Demand risk if demand guarantee is provided to the ESCo	• Planning permission • Low/zero contribution towards carbon offset funds • Heat supply and security for their properties

Roles, Responsibilities, Risks & Rewards

Role	Responsibilities	Risks	Rewards
Land Ownership	✓ Granting leases for energy centres , substations or any assets that require land. ✓ Granting easements for network routing/ asset installation. ✓ Providing rights of access for installation, operation maintenance and replacement of plant and equipment.	✓ Land misuse ✓ Land contamination	✓ Remuneration for land use
Landlordship	• Ensuring building occupiers are connected to the energy network. • Controlling access to maintain the secondary and tertiary networks, including ensuring that tenant leases reserve the necessary rights of access. • May include insuring some (e.g. secondary and possibly tertiary) network assets. • May include maintaining and replacing the tertiary network assets for rental tenants. • Where applicable, undertaking relevant Tenant Consultations.	• Operation risk i.e. payment of maintenance irrespective of use. • Performance risk in relation to the obligations around the performance of secondary and tertiary networks. • Demand risk from alternative sources of heat.	• Lower overall system whole life cost • Space savings within the property • Carbon savings • System reliability and outsourcing the supply responsibility
Installation	• Installing a network which complies with the specification. • In some projects, commissioning networks and connecting new customers. • Installing network extensions.	• Construction – H&S etc. • Design – if the installer design the network • Project delay	• Remuneration for installation (£ per connection/customer, market/scheme dependent)

Roles, Responsibilities, Risks & Rewards

Role	Responsibilities	Risks	Rewards
Operator	• Ensuring that energy of suitable quantity and quality is delivered to customers. • Where relevant, complying with the requirements of any electricity export licences or power purchase agreements. • Ensuring performance standards are met. • Undertaking maintenance, repair and (in some cases) replacement works. • Reporting to customers, landlords and the Governance body.	• Underperformance and penalties • Operational risk for adopted networks i.e. unpredictable performance and maintenance • Network expansion	• Remuneration for O&M role can be fixed price or on a cost plus margin basis.
Supplier	• Procuring energy/services delivery. • Where relevant, metering. • Billing. • Undertaking price reviews. • Attracting and securing new customers • Collection of revenues. • Managing customer debt and default. • Communicating with customers.	• Payment delay • Payment default • Demand risk • Regulatory risk • Reputational risk	• Heat supply margins • Customer confidence
Supplier of Last Resort	• Taking over Operation and Supplier responsibilities where required (including in some cases taking on Asset Ownership). • Arranging for replacement of Operator and/or Supplier roles.	• Risks similar to supplier • Rapid response requirement • Clear definition of trigger event	• Remuneration for heat supply

Delivery Models

	Key Difference:
1. Public sector funded, operated & owned • Local authority retains all risk • Competitive contracts for equipment only	Public Sector retains all risks and generates higher return
2. Public sector led and funded • Private sector assumes construction and possibly operation risk • Purchase turnkey asset delivery contract possibly with maintenance and/or operation	Public Sector does not O&M
3. Private sector invests/takes risk in some project elements • Private sector takes risk of some elements • Local authority makes areas available if required and grants lease/wayleave	Public Sector does not O&M or Fully Fund
4. Joint venture between public & public or public & private sector • Most risks and funding are shared • Joint asset ownership	Partnership Model, shared ownership and roles
5. Private sector ownership with public sector commitment • Local authority underpins key risks • Private sector owns and operates the scheme	Public sector only promotes and guarantees some demand

Decreasing Involvement from Croydon

Resource Requirement Vs Delivery Model

	Applicable If:
1. Public sector funded, operated & owned • Local authority hires staff to O&M network. Takes on metering, revenue collection, customer services	LA already has experience of engineering, procurement, etc.
2. Public sector led and funded • Local authority hires O&M Contractor. Takes on Metering, revenue collection, customer services	LA already takes on Customer facing role elsewhere
3. Private sector invests/takes risk in some project elements • Local authority does not operate network or collect revenue, however dictates rules of service • May need advice for monitoring	LA is seen as asset owners
4. Joint venture between public & public or public & private sector • Flexible model. Roles depends on risk appetite and resource availability	LA can take embed some staff into the ESCo
5. Private sector ownership with public sector commitment • Public sector is Promotor. Procures ESCo with third party guidance	LA does not have expertise in DH or desire to hire

Decreasing Involvement from Croydon

Delivery Model -1 & 2

Croydon Council Roles:

- All except installer (DM1)
- All except installer and operator (DM2)

Model Specific Risks for Croydon:

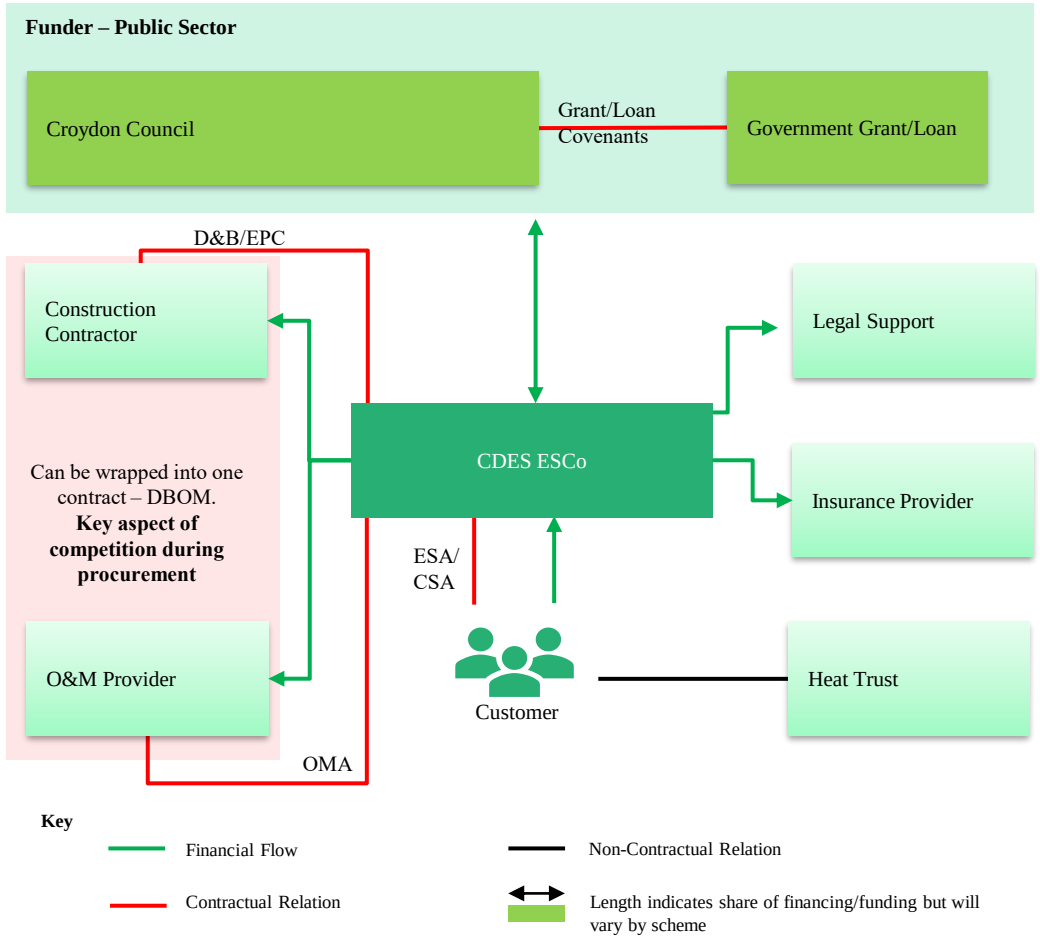
- Development, Demand build out
- Planning, Funding, Fuel price
- Technical underperformance
- O&M cost increase (DM 1 only)
- Low customer service standards (DM 1 only)
- Metering and billing faults
- Lifecycle costs increase
- Receipt of return on investment
- No/ low return on investment

Transferable Risks for Croydon:

- Delay & Design
- Operation (DM2 Only)

Croydon Reward:

Significant scheme control and financial return



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Delivery Model - 3

Croydon Council Roles:

- Promotor, Funder, Asset Owner, Governance

Model Specific Risks for Croydon:

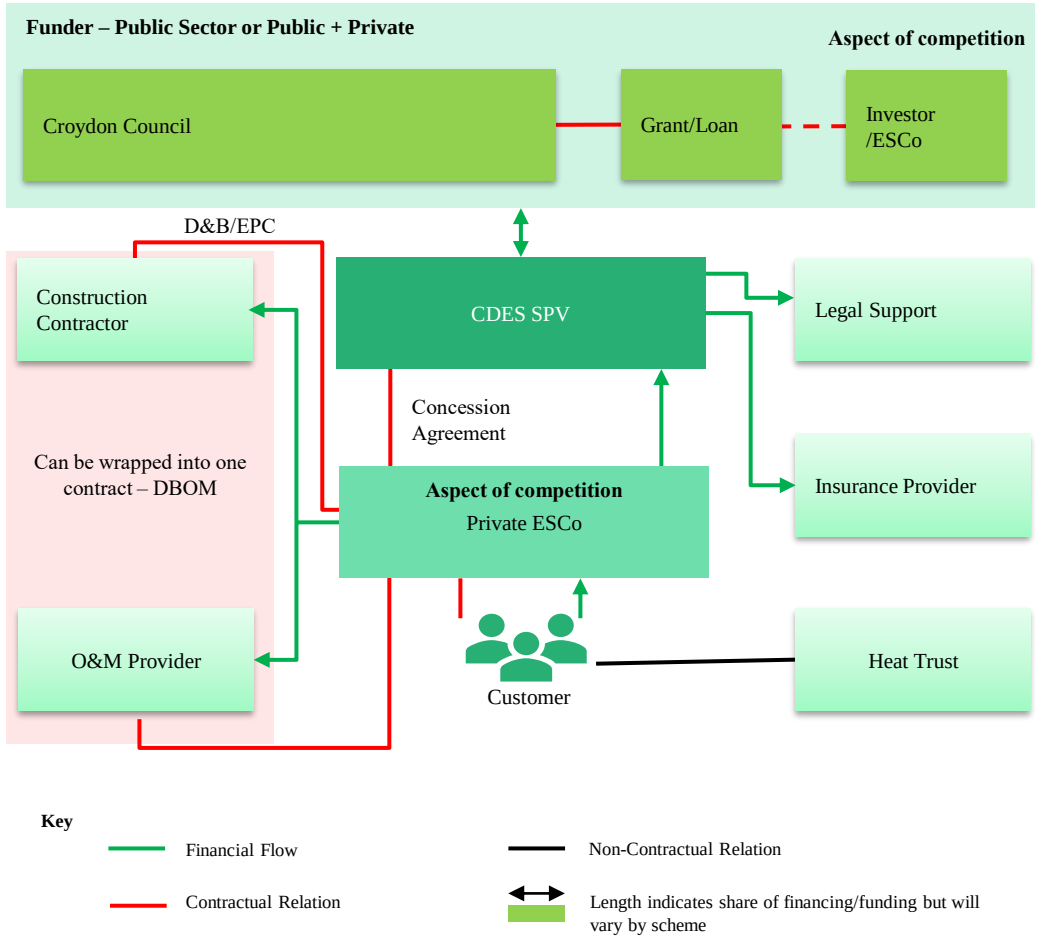
- Development, Demand build out
- Planning, Funding
- Less control over scheme

Transferable Risks for Croydon:

- Delay & Design
- Fuel Price & Operational underperformance, Low customer service standards, Metering and billing faults, Lifecycle costs increase

Croydon Reward:

Use of system charge (fixed or variable)



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Delivery Model - 4

Croydon Council & Sutton Council Roles:

- Promotor, Funder, Asset Owner, Governance

Model Specific Risks for Croydon:

- Similar to Model 3

Transferable Risks for SCEN:

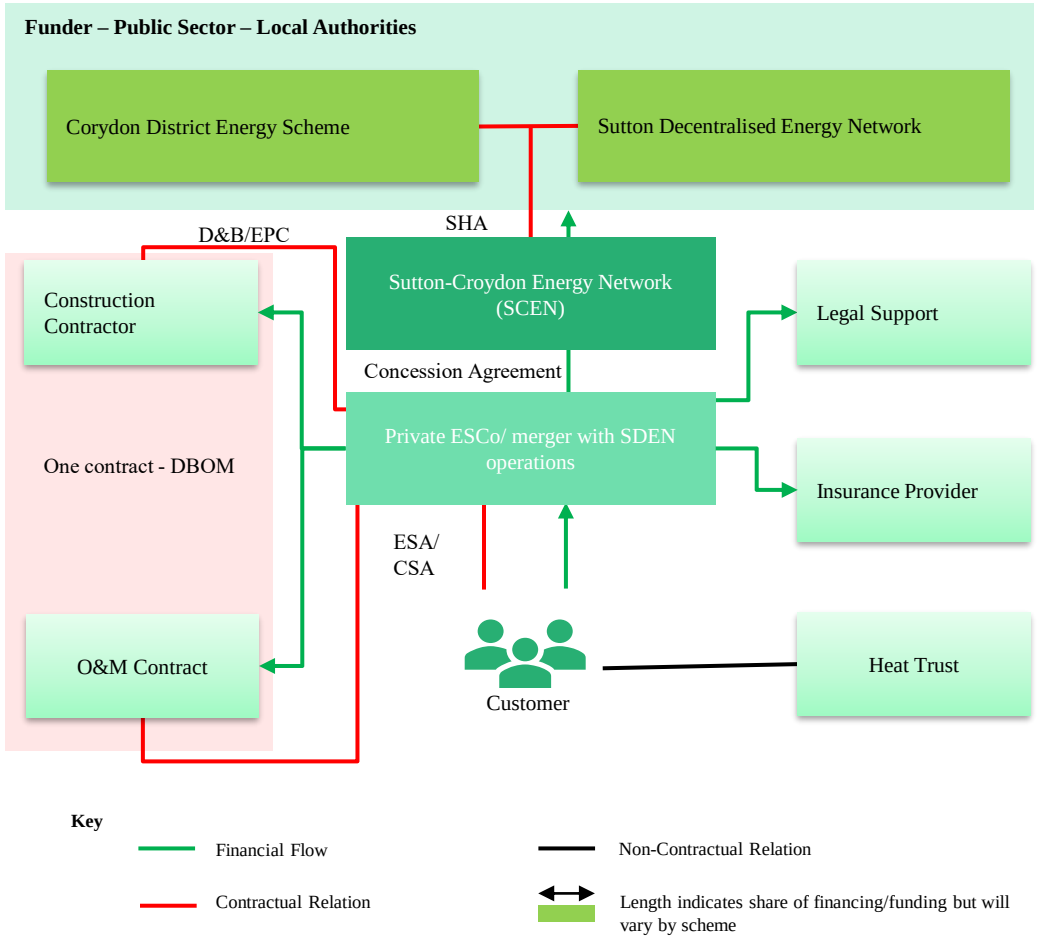
- Similar to Model 3

Croydon Reward:

Use of system charge (fixed or variable)

Scheme Benefits:

- Larger network – purchasing power for build out
- Unified tariff for South London
- Reduced negotiations on heat offtake price
- Maximises the utility of government funding
- Economies of scale benefits in operations such as customer service, maintenance etc.



Discussion

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Appendix C – Financial Model Assumptions

The table below outlines the assumptions and placeholders currently in the model which will need to be discussed further if the project were to restart.

Where it states "Arup assumption" under Source, these assumptions had not been discussed or agreed LBC's finance team as the time the project was stopped. These assumptions would need to be reviewed and agreed upon project restart.

Timing

The model currently reflects annual cashflows as per the techno-economic model based on the calendar year (Jan-Dec), however it may be useful to align these with the council's accounting period (Apr-Mar). This would require further discussions with WSP to understand if the change in timeline would impact revenues or costs.

Assumption	Cell reference	Description	Source
Financial Close Date	InpC!F51	1 Jan 19	WSP Techno-economic model (200723 Cashflow Update - no links)
Construction period	InpC!F57	3 years	WSP Techno-economic model (200723 Cashflow Update - no links)
Operations start date	InpC!F58	1 Jan 2024	WSP Techno-economic model (200723 Cashflow Update - no links)
Project length	InpC!F59	47 years from start op operations	WSP Techno-economic model (200723 Cashflow Update - no links)

Inflation

Assumption	Cell reference	Description	Source
Inflation base date	InpC!F51	1 April 2020	Arup assumption

Capex inflation	InpC!F57	3% - currently reflecting an uplift compared to CPI to reflect the historic higher inflation in construction, however will need to firm up which index should be used	Arup assumption
Opex inflation	InpC!F58	2% - Currently reflecting the long term CPI forecast	Arup assumption.

Capex

Assumption	Cell reference	Description	Source
Capex	InpS!11:22	Profiled inputs based on WSP figures	WSP Techno-economic model (200723 Cashflow Update - no links)
Repex	InpS!25:37	Profiled inputs based on WSP figures	WSP Techno-economic model (200723 Cashflow Update - no links)

Revenues

Assumption	Cell reference	Description	Source
Heat Sales income (unit price element)	InpS!56	Profiled inputs based on WSP figures	WSP Techno-economic model (200723 Cashflow Update - no links)
Capacity market income from CHP	InpS!58	Profiled inputs based on WSP figures	WSP Techno-economic model (200723 Cashflow Update - no links)

Assumption	Cell reference	Description	Source
Standing charges (heat sales)	InpS!60	Profiled inputs based on WSP figures	T WSP Techno-economic model (200723 Cashflow Update - no links)
Connection charges (heat sales)	InpS!62	Profiled inputs based on WSP figures	T WSP Techno-economic model (200723 Cashflow Update - no links)
Private wire sales	InpS!64	Profiled inputs based on WSP figures	T WSP Techno-economic model (200723 Cashflow Update - no links)
Standing charges (private wire sales)	InpS!66	Profiled inputs based on WSP figures	T WSP Techno-economic model (200723 Cashflow Update - no links)
Connection charges (private wire sales)	InpS!68	Profiled inputs based on WSP figures	T WSP Techno-economic model (200723 Cashflow Update - no links)
Electricity Export (from TC EC)	InpS!70	Profiled inputs based on WSP figures	T WSP Techno-economic model (200723 Cashflow Update - no links)
Other Income	InpS!72	Profiled inputs based on WSP figures	T WSP Techno-economic model (200723 Cashflow Update - no links)
Heat Sales Prices	InpS!90:194	Profiled inputs based on WSP figures	T WSP Techno-economic model (200723 Cashflow Update - no links)

Assumption	Cell reference	Description	Source
BAU Heat Energy and Carbon	InpS!197:301	Profiled inputs based on WSP figures	T WSP Techno-economic model (200723 Cashflow Update - no links)

Opex

Assumption	Cell reference	Description	Source
Maintenance	InpS!40:51	Profiled inputs based on WSP figures	WSP Techno-economic model (200723 Cashflow Update - no links)
Meter billing cost	InpS!77	Profiled inputs based on WSP figures	WSP Techno-economic model (200723 Cashflow Update - no links)
Gas purchase for town centre EC	InpS!79	Profiled inputs based on WSP figures	WSP Techno-economic model (200723 Cashflow Update - no links)
Cost of electricity import	InpS!81	Profiled inputs based on WSP figures	WSP Techno-economic model (200723 Cashflow Update - no links)
Other costs	InpS!83	Profiled inputs based on WSP figures	WSP Techno-economic model (200723 Cashflow Update - no links)
Heat Cost from ERF	InpS!85	Profiled inputs based on WSP figures	WSP Techno-economic model

			(200723 Cashflow Update - no links)
Additional opex costs	InpC!F138:F147	Additional placeholders for further costs such as SPV reporting or insurance	Arup assumption

Financing – senior debt

Senior debt has been switched off in the model, as it may take the form of different types of loans, or may not be feasible for certain structures.

Assumption	Cell reference	Description	Source
Gearing	InpC!F31:32	Gearing for senior debt tranches – currently zero.	Arup assumption
Senior Agent Bank Fee	InpC!F66	n/a – no bank debt assumed	Arup assumption
Senior debt – tranche 1 inputs	InpC!F69:F76	These inputs are currently unused, however provide inputs for: - Margin - base rate - repayment method - tenor - repayment start date - arrangement and commitment fees	Arup assumption
Senior debt – tranche 1 inputs	InpC!F78:F86	These inputs are currently unused, however provide inputs for: - Margin	Arup assumption

		- base rate - repayment method - tenor - repayment start date - arrangement and commitment fees	
Minimum DSCR	InpC!F89	The minimum target DSCR for senior debt – currently unused	Arup assumption

Equity

Assumption	Cell reference	Description	Source
Share capital gearing	InpC!F35	100% - for simplicity at this stage, however will need to be adjusted to reflect the different structures	Arup assumption
Shareholder Debt gearing	InpC!F36	Calculated based on gearing of the senior debt and equity	
Shareholder debt interest rate	InpC!F93	n/a – not currently used	Arup assumption
Shareholder valuation date	InpC!F127	1 Jan 2020	Arup assumption
Shareholder target rate of return	InpC!F128	n/a – not currently used	Arup assumption

Grant funding

Assumption	Cell reference	Description	Source

Grant funding amount	InpC!F96	Amount of grant funding in project	Arup assumption
Grant funding maximum amount	InpC!F97	Maximum amount of grant funding available	Arup assumption – will ultimately need to reflect the same figure as above for presentational purposes

Reserve accounts

Assumption	Cell reference	Description	Source
DSRA		Calculated on the forecast annual debt payment on the reserves tab	Arup assumption
MRA	InpC!120:124	Amount look forward to reserve for repex costs	WSP Techno-economic model (200723 Cashflow Update - no links)

High Level Tax and Accounting

Assumption	Cell reference	Description	Source
Accounting	Accounting tab	High level fixed asset accounting with straight line depreciation	Arup assumption
Capital allowances – special pool rate	InpC!F107	18%	As per government publication
Capital allowances – Main pool rate	InpC!F108	6%	As per government publication

Capital allowances – special pool allowance	InpC!F110	n/a - not currently used, but could be in future following further analysis	Arup assumption
Capital allowances – Main pool Allowance	InpC!F111	n/a - not currently used, but could be in future following further analysis	Arup assumption
Corporate tax rate	InpC!F114	19%	As per government publication

Appendix D – Financial Model Functionality

The financial model has been developed based on the WSP's techno-economic model (*200723 Cashflow update – no links*). In this section, we will describe the functionality in the financial model and in the section below we outline the assumptions in the current model.

We have not included any results at this stage, as the included modelled assumptions have not yet been discussed with LBC, and these will need to be refined before developing meaningful outputs.

We also note that we have replicated functionality from the WSP model, however where functionality is not used, it hasn't yet been fully tested, so if these are used in future, further review will be required to ensure the inputs, calculations and outputs are working as intended.

The table below outlines the model tabs, and functionality included within each.

Tab	Description
Notice	This is our standard disclaimer that accompanies the model.
Interface InpC	This tab incorporates constant (not time variable) assumptions in a format similar to the WSP techno-economic model, which includes: - Capex and Repex inputs for the heat network - Maintenance inputs for the heat network - Capex and Repex for the ERF link - Maintenance for the ERF link - Meter and billing costs for the network
Interface InpS	This tab incorporates time variable assumptions in a format similar to the WSP techno-economic model, which includes: - Time variable income inputs - Time variable cost inputs - Heat prices and costs - BAU heat energy and carbon
InpC	Inclusion of constant inputs and a few outputs: - IRRs, ratios, debt gearing as high level outputs - Optimisation inputs

Tab	Description
	- General model and timeline inputs - Funding inputs including interest rates, fees and minimum ratios - Inflation inputs - Tax - Reserve accounts - Sensitivity levers - Opex inputs for any additional costs such as SPV report and insurance
InpS	Inclusion of time based inputs including: - CAPEX - REPEX - Maintenance - Opex - Revenues including heat sales - BAU heat energy and Carbon requirements
Optimisation	These inputs need to be iterated to optimise the model. This sheet enables optimised funding requirements and debt repayment profiles to be stored for each scenario
Time	This sheet calculates flags and inflation profile for the concession and debt.
Capex	Calculates Capex and Repex costs
Opex	Calculates Opex and Maintenance costs
Heat Sales Revenues	Calculates revenue from heat sales only in real terms
Revenues	Calculates all nominal revenues for the project
Tax	Calculates tax payable for the project including ability to include capital allowances.

Tab	Description
	Please note, this model currently does not calculate the impact of BEPS (deductibility of debt interest from profits, and restrictions for losses carried forward) This tab also calculates any deferred tax asset/liability reflecting the difference in tax payable on the P&L and cashflow.
Accounting	Calculates the value of the asset, depreciation and any residual value. It also includes how a grant will be accounted for during the project.
Reserves	This includes the provisioning for reserves: - Debt service reserve account - Maintenance reserve account
Funding requirement	Calculations to reflect how the capital costs will be funded
Debt	This includes the calculation of two loan tranches: - The tranches can accommodate both PWLB and senior debt loans - Interest costs calculated on a days in period basis - Arrangement and commitment fees included - Repayments can either be sculpted, or paid as an annuity - Calculation of agency fees during operation
Equity	Calculation of share capital, shareholder loan, and dividends
Fin_stats	P&L, balance sheet and cashflow for the project
Ratios	Calculation of debt service cover ratios (backward and forward) and the loan life cover ratio
VAL	Calculation of project and shareholder returns
Summary	Summary showing key inputs, outputs and graphs
Graphs	Key graphs and graph data for the project

Tab	Description
Checks	Reflects all the checks built into the model