Shoreham Harbour Heat Network Study

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LIST OF ABBREVIATIONS

ADC	Adur District Council
ADE	Association for Decentralised Energy
BHCC	Brighton & Hove City Council
BSRIA	Building Services Research and Information Association
CHP	Combined heat and power
CIBSE	Chartered Institute of Building Services Engineers
CAPEX	Capital expenditure
DECC	Department for Energy and Climate Change
DEN	District Energy Network
EfW	Energy from waste
EGP	Edgeley Green Power
EGPS	Edgeley Green Power Station
HNDU	Heat Network Delivery Unit
IRR	Internal rate of return
JAAP	Joint Area Action Plan
kWh	Kilowatt hour
MWh	Megawatt hour
NPV	Net present value
MSHP	Marine source heat pump
RHI	Renewable Heat Incentive
SEL	Sustainable Energy Limited
SHLAA	Strategic Housing Land Availability Assessment
SHRP	Shoreham Harbour Regeneration Partnership
SPF	Seasonal Performance Factor (for Marine Source Heat Pumps)
SPS	Shoreham Power Station
WSCC	West Sussex County Council

EXECUTIVE SUMMARY

This report presents the findings of the Shoreham Harbour Heat Network Study (2015). The project partners include Brighton and Hove City Council, Adur District Council, Shoreham Port Authority and Edgeley Green Power Ltd (EGP) with support from West Sussex County Council and the Heat Network Delivery Unit (HNDU) of the Department of Energy and Climate Change (DECC). The work was conducted by Sustainable Energy Ltd (SEL) in partnership with COWI and Carbon Trust. SEL managed the project and undertook the majority of analysis and report writing. Carbon Trust provided key inputs addressing prioritisation, planning, financial assessment and governance models and COWI provided technical information, strategic support and technical review services.

The study has been undertaken for two reasons: to inform local planning policy, in particular the Shoreham Harbour Joint Area Action Plan (JAAP); and in response to the opportunity to deliver district heating from Shoreham Port, presented by the planned development of a 32MW power station, Edgeley Green Power Station (EGPS) on the South Quayside. The study explores potential heat networks that could be fed by EGPS as well as the potential for heat network delivery through other heat delivery means. The Study has been funded mainly by DECC via the HNDU.

The study considers viability and assesses risk for district energy network options under two scenarios: scenario A where EGPS provides heat to three large phased network options; and scenario B where EGPS is not developed and other heat sources provide heat to five potential network phases. EGPS could provide a significant opportunity to develop a large heat network that may have the potential to reduce energy costs and/or generate revenue[1] (business model dependant), reduce carbon emissions, promote development opportunities and help alleviate fuel poverty in the area.

Data collection and review
The first stage of the work involved a review of previous district heating studies and a detailed data collection exercise that required site visits, meetings, telephone calls and email correspondence. Building energy data and other relevant information was collected from the project partners, other stakeholders and mapping data bases. A low number of responses were received from potential heat loads in the private sector and historical energy data was not available for Adur Homes.

Energy demand assessment
Heat demand models were produced for key potential heat loads and the resultant demand profiles were combined to assess the overall heat demand for different sized heat clusters and network options. Electricity demands were assessed in order to investigate options for private wire arrangements. The majority of heat demands are located to the north of the River Adur and canal basin and the planned developments along the Western Harbour Arm have the highest potential heat density. In other areas there is a relatively low linear heat density as many of the heat demands are small and inconsistent and do not provide potential key anchor loads (large consistent heat demands) for a heat network. Without these, network viability relies on scale i.e. a large number of small heat demands.

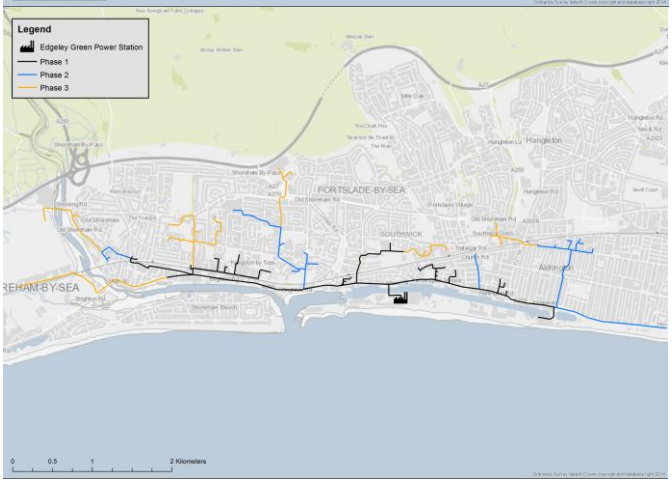
Summary of priority network options
After an initial assessment of heat demands, pipe routes and heat sources, a number of network phase options were selected for more detailed assessment. Network options were explored under the two scenarios described above. Scenario A considered network options connected to EGPS and scenario B explored alternative heat source technologies and included marine source heat pumps, biomass boilers, gas CHP and biofuel CHP. Phases for each scenario (where potentially viable), and the timing of development phases were then produced. Potentially viable network options were then identified and these are summarised in the table below.

[1] As district energy networks are rateable assets (under business rates), and local authorities can collect and retain 100% of rates from renewable energy schemes, there is potentially a further incentive to promote delivery of district energy networks in Shoreham.

Scenario	Phase	Network trench length	Total heat demand	Peak demand	No. of heat loads	Potential delivery date
A – Edgeley Green Power	1	12.5 km	57,003 MWh	22 MW	201	2020
	2	19.5 km	92,405 MWh	36 MW	274	2020
	3	29 km	133,143 MWh	52 MW	384	2035
B – Alternative Heat Sources	1a	1.7 km	17,306 MWh	8 MW	32	2020
	1b	6.4 km	32,296 MWh	13 MW	97	2020
	2	7.3 km	48,581 MWh	17 MW	122	2035
	3	13 km	71,699 MWh	25 MW	215	2035
	4	21 km	106,975 MWh	36 MW	288	2035

The potential network routes and summaries for Scenarios A and B are shown below:

Scenario A



Scenario A Phase 1 Network Summary (EGPS)	
Network trench length	12.5 km
Total heat demand	57,003 MWh
Peak demand	22 MW
Number of heat loads	201
Potential delivery date	2020
Network heat loss	12%

Priority heat loads:
- Western Harbour Arm Flats 1, 2, 9, 10, 21 planned developments
- Adur Civic Centre redevelopment
- South Portslade residential development 1.1
- Vega social housing

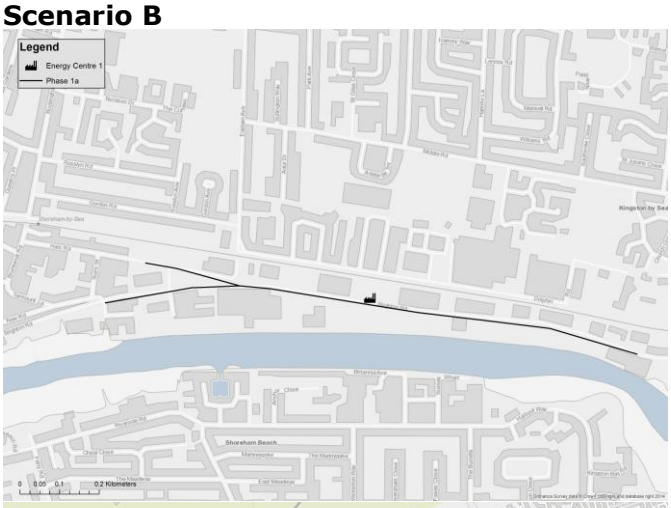
Scenario A Phase 2 Network Summary (EGPS)	
Network trench length	19.5 km
Total heat demand	92,405 MWh
Peak demand	36 MW
Number of heat loads	274
Potential delivery date	2020
Network heat loss	12%

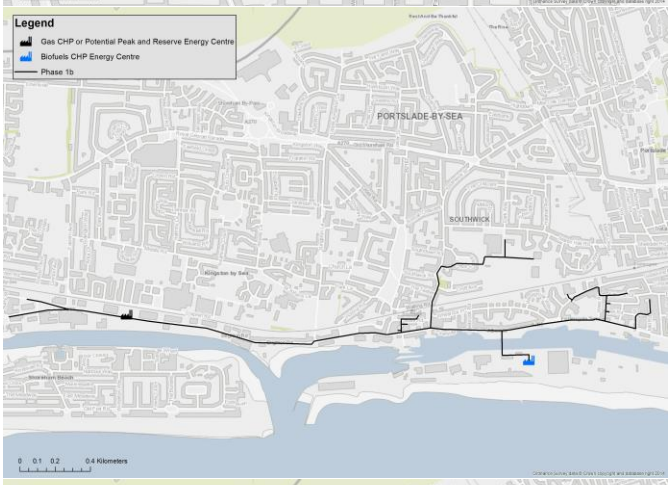
Priority heat loads include phase 1 plus:
- King Alfred Leisure Centre planned development
- Shoreham Academy
- Steven's Court social housing
- Southlands residential development
- Southlands Hospital

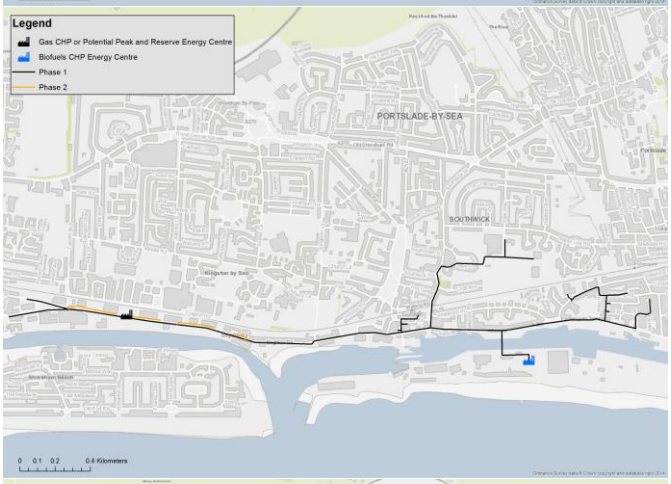
Scenario A Phase 3 Network Summary (EGPS)	
Network trench length	29.0 km
Total heat demand	133,143 MWh
Peak demand	52 MW
Number of heat loads	384
Potential delivery date	2035
Network heat loss	12%

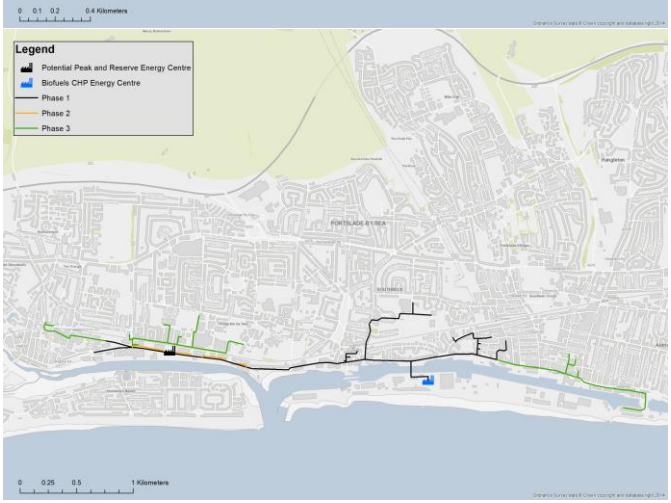
Priority heat loads include phase 2 plus:
- 79-81 Brighton Road

Scenario B









Scenario B Phase 1a Network Summary (Gas CHP)	
Network trench length	1.7 km
Total heat demand	17,306 MWh
Peak demand	8 MW
Number of heat loads	32
Potential delivery date	2020
Network heat loss	5%

Priority heat loads:

- Western Harbour Arm Flats 1, 2, 5, 6, 9, 10 & 21 planned developments
- Adur Civic Centre redevelopment

Scenario B Phase 1b Network Summary (Biofuels CHP)	
Network trench length	6.4 km
Total heat demand	32,296 MWh
Peak demand	14 MW
Number of heat loads	97
Potential delivery date	2020
Network heat loss	10%

Priority heat loads include phase 1a plus:

- Eastbrook Primary Academy (north site)

Scenario B Phase 2 Network Summary (Biofuels CHP)	
Network trench length	7.3 km
Total heat demand	48,581 MWh
Peak demand	17 MW
Number of heat loads	122
Potential delivery date	2035
Network heat loss	7%

Priority heat loads include phase 1 plus:

- 79-81 Brighton Road
- Western Harbour Arm (phase 3) flats 7 & 10

Scenario B Phase 3 Network Summary (Biofuels CHP)	
Network trench length	13.0 km
Total heat demand	71,699 MWh
Peak demand	25 MW
Number of heat loads	215
Potential delivery date	2035
Network heat loss	9%

Priority heat loads include phase 2 plus:

- South Portslade residential development 1.1

Scenario B Phase 4 Network Summary (Biofuels CHP)	
Network trench length	21.0 km
Total heat demand	106,975 MWh
Peak demand	36 MW
Number of heat loads	288
Potential delivery date	2035
Network heat loss	10%

Priority heat loads include phase 3 plus:

- King Alfred Leisure Centre planned development
- Stevens Court
- Shoreham Academy
- Southland's Hospital residential development

The table below summarises the high level financial viability of the network options selected for further assessment.

Scenario	Phase	Heat source	Estimated Capital Costs	25 Year Financial Case			Annual Carbon Saving (tonnes)	Risk level
				Payback	IRR	NPV		
A	1	EGPS	£18,289,822	13 years	7%	£8,271,631	11,131 tCO_2	High
	2		£28,351,373	13 years	7%	£15,197,019	18,040 tCO_2	High
	3		£38,994,806	13 years	7%	£20,925,870	24,968 tCO_2	High
B	1a	Gas CHP	£5,027,405	12 years	8%	£3,393,328	3,700 tCO_2	High
	1b	Biofuel CHP	£8,869,164	11 years	9%	£6,798,594	6,459 tCO_2	High
	2	Biofuel CHP	£9,856,177	8 years	13%	£14,855,413	10,042 tCO_2	High
	3	Biofuel CHP	£17,352,885	10 years	10%	£17,617,009	14,396 tCO_2	High
	4	Biofuel CHP	£26,746,217	11 years	9%	£23,032,923	20,548 tCO_2	High

All options considered present 'high risk' opportunities as the high level financial cases for the phase 1 schemes have IRRs of less than 10%, this is likely to restrict financing opportunities. Private sector developers would require IRRs well in excess of 10%, therefore options are only likely to be viable if developed by, or with financial support from EGPS, with a grant, or with a mix of grant funding and public sector borrowing.

Scenario A - summary

The most likely scenario for development occurs under scenario A where EGP drive, finance or incentivise the development of a large network in order to receive the benefits associated with achieving certification as Good Quality CHP[2]. If EGPS is developed without an associated heat network, the local authorities may receive criticism and reputational damage for failing to facilitate a network development if the potentially low carbon, low cost heat resource is perceived as being wasted.

In these circumstances, the project partners can play an important facilitating role but will need to undertake a series of corporate actions to promote and enable the scheme. These actions could include facilitating engagement between key stakeholders, providing land for energy centres and pipe routes, committing to long term purchasing contracts, providing planning support, including heat networks in

[2] CHPQA (Combined Heat & Power Quality Assurance) is a voluntary UK government scheme to encourage the development of Good Quality CHP Schemes. If a specified required quantity of useful heat can be provided to a network then CHPQA accreditation will allow EGP to claim: an uplift from 1.5 to 2 ROCs per MWh of output generation; Enhanced Capital Allowances (ECAs); exemption from the Climate Change Levy (CCL); and potential business rates exemptions.

planning policy and/or energy strategies, encouraging heat intensive businesses (potential key anchor loads) to locate in the vicinity and providing resource and financial assistance.

Scenario B - summary
If EGPS is not developed, district heating opportunities are significantly reduced. There is a high risk opportunity to develop the small scenario B phase 1a, gas CHP embryo network. There may be limited opportunities to attract private finance due to the low IRR and risk associated with engaging with developers and securing private wire arrangements with private residential users.

Therefore the scheme will only be a viable proposition with a grant or a mix of grant funding and public sector borrowing. Phase 1a is likely to be the only small, potentially viable scheme in the heat map area and may be progressed by local community energy groups with the proposed Sussex Energy Tariff providing important contributions towards progressing the scheme and engaging with end users.

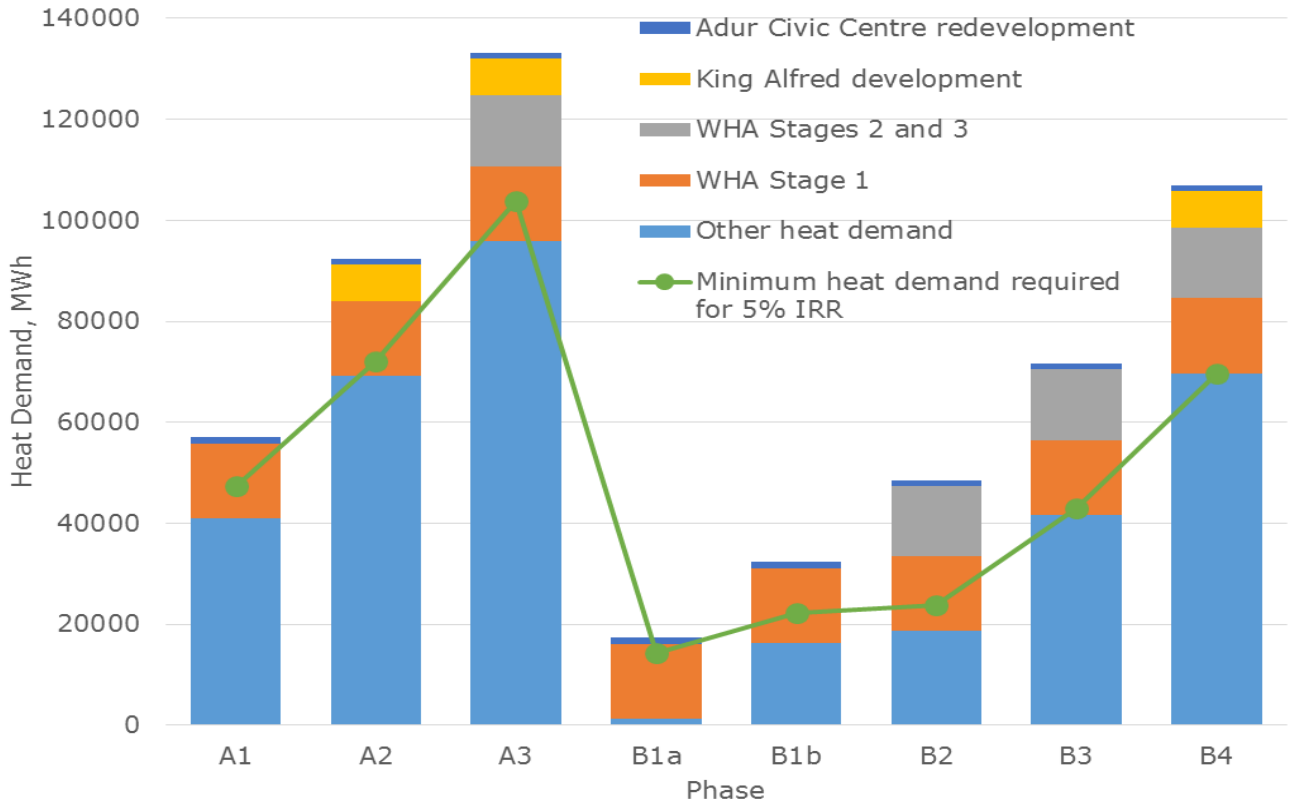
If Edgeley Green Power Station is not developed, a biofuel CHP plant provides the most likely source of low cost, low carbon heat for a larger network under Scenarios B 1b, 2, 3 and 4 based on the high level techno-economic evaluation undertaken in this study. The project partners may provide an enabling role to promote the site to other organisations but, unless a developer comes forward, delivery of a large network is unlikely to be viable.

Sensitivity and risk
The table below summarises the key risks for the network options.

Scenario	Phase	Key risks
A&B	All	• Connection risk (existing or planned buildings not connecting) • Low linear heat density (associated with dispersed heat loads) • Availability of land for energy centres • Changes to planned developments • Unsuccessful engagement with developers • Increases in capital cost • Existing social housing not incorporating communal wet heating systems • Increased costs encountered when installing network due to groundwater and contaminated land issues • Low cost, low carbon heat from EGPS not being used (if a network is not developed)
Scenario A	1, 2 & 3	• Prohibitive heat offtake price • Accessing the tunnel beneath the Port canal • The network crossing physical barriers such as the railway line and A259 • Difficulty securing gas supplies for peak and reserve boilers if located on Port site
Scenario B	1a	• Changes to energy tariffs • Increases in capital cost • Securing private wire arrangements with private sector residential developments
	1b, 2, 3 & 4	• Biofuels CHP developer does not come forward • Prohibitive biofuel CHP heat offtake costs • The network crossing physical barriers such as the railway line and A259 • Difficulty securing gas supplies for peak and reserve boilers if located on Port site

For both scenarios A and B, the connection risks are significant due to a high number of connections including planned developments and private sector buildings. If priority heat loads do not connect, viability will be reduced. Reductions in heat demand of between 17% and 50% will reduce IRRs to below 5% and are likely to make the options unviable. The critical heat loads are Western Harbour Arm developments (stage 1), Adur Civic Centre redevelopment and King Alfred Development. The figure below showing a summary of key heat demands and their impact on the financial viability of network options quantifies these key heat demands and their impact on the financial viability of the

network phases. It clearly demonstrates that connection to the planned development at Western Harbour Arm (stage 1) is essential to provide the heat demand to initiate a heat network and the network options are unlikely to be viable if the Western Harbour Arm development does not come forward or connect. As these key heat demands are planned private sector developments there are very high associated connection risks. Successful engagement with the developers of these sites is critical to network viability.



Summary of priority heat demands and their impact on the financial viability of network options

If EGPS is developed without an associated heat network, the local authorities may receive criticism and reputational damage for failing to effectively facilitate a network coming forward if the potentially low carbon, low cost heat resource is perceived as being wasted.

If a detailed techno-economic feasibility study is to be progressed, significant further work will be required to engage with developers of planned priority heat loads, namely Western Harbour Arm developments (stage 1), Adur Civic Centre redevelopment, King Alfred Development, and existing priority heat loads, namely Shoreham Academy, Southlands Hospital and 79-81 Brighton Road.

Lower risk public sector heat networks have been assessed (see Appendix 3 – Public Sector Network Assessment) and are unviable due to the dispersed nature of the heat loads.

The 'preferred' network options outlined in Scenario A are reliant upon the development of EGPS and planned developments being brought forward. If EGPS, or another biofuel CHP scheme, is not developed there are very limited opportunities with borderline viability at best i.e. Phase 1a with gas CHP (with private wire arrangements) or Marine Source Heat Pump (if RHI is still available).

Summary of recommendations
The table below summarises the recommendations made in this report.

Recommendation	Indicative timeline[3]
Project strategy	
1. Consider the findings of this study to decide how best to support district energy developments.	*Immediate*
2. Receive updated technical, financial and project management information from EGP in order to inform the above decision.	
3. If EGPS is to be developed the project partners should enable and support the development of a network utilising heat from EGPS.	
4. Set clear objectives on what the network is attempting to achieve, linked to corporate priorities, and ensure senior management support by effectively communicating the project benefits.	*Short term*
5. Set up an internal project steering group and look to allocate resource to adequately support the feasibility process.	
6. Once the development plan for EGPS is confirmed, in consultation with EGP, the project partners should develop a clear timescale of decisions that must be met in order to align with EGP's development plan.	*Immediate and short term*
Resource	
7. Provide mechanisms and capacity to support network delivery at strategic and officer levels e.g. extend or create a new Project Board for project delivery and ensure officer capacity is available to support project delivery. Capacity should be made available by public sector project partners to work closely with developers and, if district heat projects are progressed, additional resource should be secured.	*Short term*
8. Discuss the viability of funding additional resource both internally and with support from DECC or the Your Energy Sussex Partnership; if the opportunity is deemed viable requirements of the role will need to be defined and a procurement route agreed.	*Short term*
Corporate (public sector partners)	
9. Facilitate engagement between key stakeholders, such as site businesses and developers.	*Short term*
10. Provide resource and financial assistance in delivering feasibility and design work.	*Short and medium term*
11. If EGPS is not developed the public sector partners may provide an enabling role to promote the EGPS site to other biofuel CHP developers.	
12. Encourage heat intensive businesses to locate in the vicinity of EGPS.	*Short, medium and long term*
13. Provide and/or secure land for construction of peak and reserve energy centres and pipe routes.	*Medium term*
14. Commit to long term purchasing contracts with the network operator.	

[3]

Indicative timeline	Project stage
Immediate	Prior to feasibility
Short term	During feasibility
Medium term	During detailed project development
Long term	During project delivery

15. Engage with and support planning consents and highways activities.	
Project development	
16. Undertake detailed consultation with all potential developers and, in particular, those seeking to bring forward Western Harbour Arm developments (stage 1), Adur Civic Centre redevelopment, King Alfred Development and identify business cases for planned developments to connect to the network (from the developer's perspective).	*Immediate and as developments are brought forward*
17. Develop an external stakeholder engagement plan to support the project development process.	*Short term*
18. Undertake further stakeholder engagement exercises including: discussions with key heat load clients to obtain historical energy data, technical details and to gauge enthusiasm for the project.	
19. Update heating / cooling demand and supply assessment to include: an updated energy demand and supply assessment for the prioritised areas; detailed consideration of the condition/asset survey currently being undertaken on behalf of Adur Homes; and site surveys to assess the financial cases for existing key heat loads to connect.	
20. A concept design should be developed for peak and reserve energy centre and plant to include a review of recommended energy centre location(s), relevant general arrangements, specifications and indicative sizing for all key plant and equipment items.	
21. A concept design should be developed for the heat network to include a detailed network analysis, optimisation and design for the priority network incorporating concept drawings, process flow diagrams and GIS representations.	
22. The project partners and/or representatives should liaise with potential end-users to seek assurances for heat offtake.	
23. Conduct detailed investigation of physical barriers, particularly in relation to crossing the railway line, crossing/disrupting main roads and contaminated land and groundwater issues.	
24. Develop a detailed financial model to determine all relevant financing options, scheme costs and income for the scheme taken forward; this should involve developing a detailed 25 year and 40 year life cycle, discounted cash flow model.	
25. Explore options for raising further financial support through grants, HNDU (for further feasibility work), Government district energy capital investment grants[4], European Regional Development Fund (ERDF), European Local Energy Assistance (ELENA) programme (for network development work), Your Energy Sussex, SALIX[5] and ECO (for connection and retrofit works to public sector buildings).	
26. Develop an implementation programme and phasing plan to include an investment timeline and delivery plan.	
Planning	
27. The JAAP, Adur Local Plan and B&H City Plan should be amended in line with the specific recommendations made in this report.	*Short term*
28. If EGPS is developed, it is recommended that the project partners set local requirements for decentralised energy which relate to the priority network identified in Scenario A.	
29. Planning authorities should require proposed developments to connect to a network where it exists, or for the development to be designed so that it can connect to a future network where a viable network is identified.	
30. District heating potential should be included in both the Adur and Brighton & Hove Infrastructure Delivery Plans and where CIL is being adopted, in the Regulation 123 Charging Schedule.	

[4] £300M announced at November spending review to bring forward 200 heat networks in England and Wales.
[5] Interest free loans for connection to existing district heating via plate HE and thermal stores.

31. Consideration should be given to the use of Section 106 Agreements to: collect contributions for heat network schemes; oblige developers to connect to planned networks, existing networks and networks under construction; set specific technical requirements to enable connection; and futureproof connections to planned networks.	
32. Consideration should be given to securing additional planning resources with which to support development of district heating schemes and engagement with developers.	
33. Safeguard energy centre locations and encourage heat intensive business to locate in the vicinity of EGPS.	*Short, medium and long term*

Planning recommendations
Planning policy and planning teams play a crucial role in the development of heat network projects. The technical and financial work undertaken will provide an evidence base for drafting planning policy to support developer negotiations, planning conditions, Section 106 Agreements and the Community Infrastructure Levy.

Project partners should set local requirements for decentralised energy which relate to the potentially viable network options and development areas identified in this report. This will include requiring proposed developments to connect to a network where it exists, or for the development to be designed so that it can connect to a future network where there is a planned or identified network.

The planning authorities in the Shoreham area should develop development management processes to require proposed developments to connect to a network (where it exists), or for the development to be designed to have capacity to connect to a future network (where it is planned or identified).

The planning authorities in the Shoreham area can require proposed developments to connect to a network (where it exists), or for the development to be designed so that a development can connect to a future network (where it is planned or identified).

Section 106 Agreements may be used to promote network development but have had limited application in a district heating context, and as such the strength of this mechanism in supporting heat network development is relatively untested. It is likely that the project partners will require additional technical and planning resource with which to support engagement with developers addressing district heating.

Next steps
The project partners should carefully consider the findings of this study to decide how best to support district energy developments in the Shoreham Harbour area. This decision will be heavily influenced by news on the progression of EGPS. Detailed further discussion is essential as the development plans for the power station project are critical to informing the next steps.

1 INTRODUCTION

1.1 General

The contract for the Shoreham Harbour Heat Network Study was issued following a tender process by Brighton and Hove City Council (BHCC) on behalf of the project partners. The project was initiated on 13th April 2015.

1.2 Project Aims

The agreed scope of the energy mapping and masterplanning study comprised:

- A detailed energy mapping study of the proposed area to identify potentially useful heating, cooling and power demand loads, and potentially useful heat supply opportunities for the purposes of district heating developments. This included:
  - A review of previous work and data collection exercises
  - A review of the heat mapping 'red line' boundary
  - A heat mapping exercise for the revised 'red line' boundary area
- Develop an energy masterplan for the proposed area identifying, evaluating and prioritising any potential district heating scheme opportunities. This included:
  - Identification of scheme and network options
  - Technology appraisal
  - District heating network expansion opportunities
- High level technological and economic feasibility study for identified district heating schemes including an assessment of financial viability for network scenarios.
- Project meetings and workshops to present findings and receive feedback.
- Production of a sensitivity analysis spreadsheet and final report.

1.3 Project Background

BHCC have commissioned this study on behalf of the project partners consisting of BHCC, Adur District Council (ADC), Shoreham Port Authority (SPA), Edgeley Green Power Ltd, and the Shoreham Regeneration Partnership (consisting of the aforementioned local authorities as well as West Sussex County Council (WSCC) and SPA). Funding was provided by partners referred to above (except WSCC) and the Department of Energy and Climate Change (DECC) Heat Network Delivery Unit (HNDU). The partners collaborated on this work to develop a high level feasibility study for heat network options potentially anchored at Shoreham Port and benefitting the four authority areas.

The SHRP are producing a Joint Area Action Plan[6] (JAAP) for Shoreham Harbour which identifies a set of locally supported and sustainable proposals for Shoreham Harbour to be delivered over the next 15 to 20 years. The Shoreham Harbour regeneration area, as identified in the JAAP, is located between the western end of Hove seafront and the Adur Estuary at Shoreham-by-Sea, as shown in Figure 1. The JAAP distinguishes four strategic development sites identified within the JAAP area which have been deemed critical to the realisation of the long-term strategy for the harbour. These four areas are:

- Aldrington Basin
- South Portslade
- Southwick Waterfront
- Western Harbour Arm

[6] The JAAP is being updated following consultation undertaken in February 2014. The draft consultation version of the Shoreham Harbour Joint Area Action Plan (2014) can be viewed here: http://www.adur-worthing.gov.uk/shoreham-harbour-regeneration/jaap/

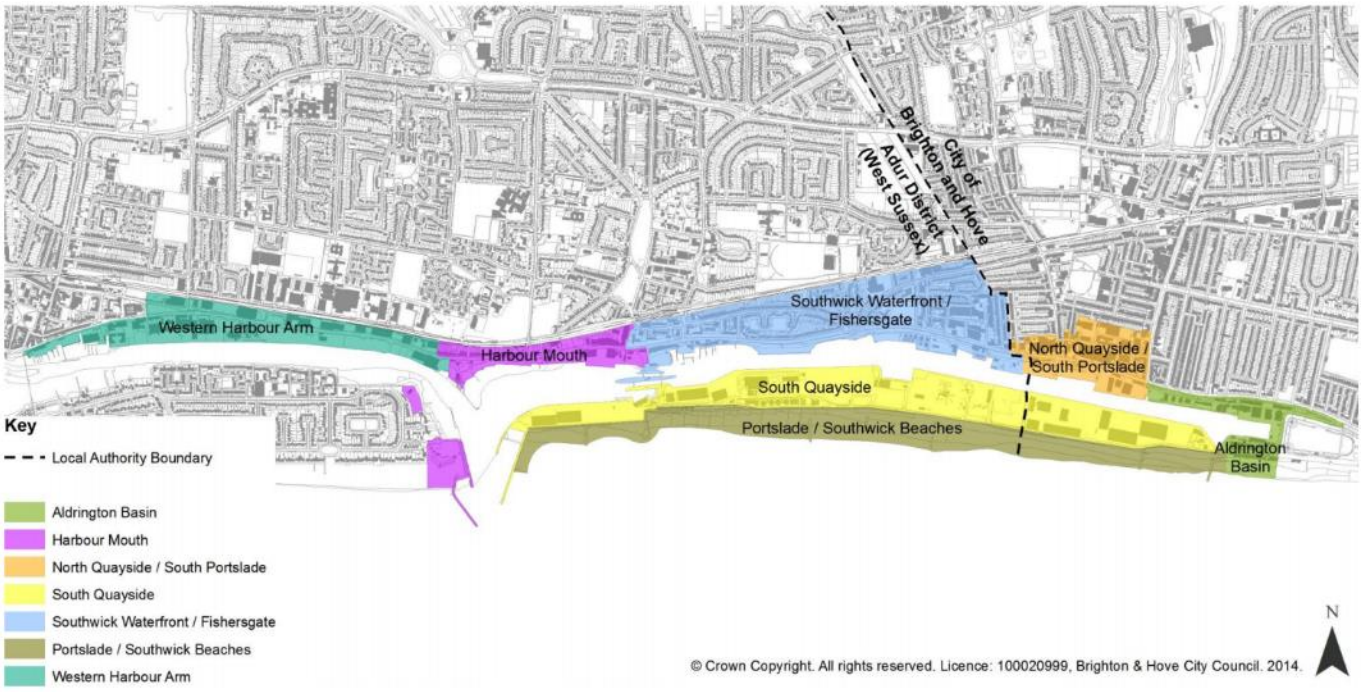


Figure 1: Joint Area Action Plan character areas[7]

Alongside the JAAP, the Local Authorities are also developing their own Local Development Framework documents, namely Brighton & Hove Submission City Plan[8] and the Adur Local Plan[9].

1.4 Project Drivers and Objectives

The main drivers for this project comprised:

- Funding received from HNDU to undertake heat-mapping, energy master-planning for heat network delivery in the Shoreham area.
- Planning permission awarded to Edgeley Green Power Station to build a biofuels CHP power station at Shoreham Port.
- The existence of Shoreham Power Station on the South Quayside character area of the JAAP and opportunities for potential heat off-take options now and in the future. Previous assessments of heat offtake from Shoreham PS have revealed no financially viable opportunities, but there is a desire from public sector partners to critically review and refresh this assessment and examine potential opportunities for future heat off-take.
- The need to explore models for delivery, and options for a network and its operation potentially anchored at Shoreham Port and fed by the new and existing power stations.
- The need to model existing and future heat customers from existing development and planned development in the area through the JAAP, Adur Local Plan and Brighton & Hove Submission City Plan.
- Positive findings of previous energy studies for the Shoreham Harbour area which have identified opportunities for district heating in the area, with the need to undertake new heat mapping, and refresh, expand and focus existing heat mapping.
- Existing development in the vicinity of the Port and surrounding area where there is an interest in benefitting from exported heat, in particular those buildings owned by the Port and Local Authorities including Adur Homes properties.
- Further joint working between councils on the Sussex wide energy saving partnership of local authorities "Your Energy Sussex" (YES) with Carillion under which district heating could be potentially delivered.

[7] http://www.adur-worthing.gov.uk/media/media,121462,en.pdf
[8] Brighton & Hove Renewable & Sustainable Energy Study (AECOM 2012): http://www.brighton-hove.gov.uk/sites/brighton-hove.gov.uk/files/downloads/ldf/BrightonandHove_Energy_Study_Jan2013.pdf
[9] Adur District Energy Study (Element Energy 2009): http://www.adur-worthing.gov.uk/media/media,129655,en.pdf

- Brighton & Hove and Adur & Worthing Councils are actively seeking to identify and develop cost-effective heat distribution networks that deliver energy efficiency, carbon reduction and protection against fuel poverty.
- Shoreham Port Authority, as a community trust port, has 'EcoPort' status and is committed to promoting renewable energy generation.
- Local interest from community energy organisations and companies such as Brighton Energy Cooperative (BEC) and Brighton and Hove Energy Services Cooperative (BHESCO).
- Enhancement and updating of the existing Brighton & Hove Energy Study (2012) was required. This study identified Shoreham Harbour as one of 14 heat clusters in the city, but the initial heat mapping from the study required enhancement of this cluster and surrounds. Heat mapping for the Adur area was undertaken in a separate study in 2009, however this included planned development that has now been significantly reduced. This therefore also required updating and extending.

The public sector partner objectives for this project comprised:

- Carbon reduction, climate change mitigation, greater resource use efficiency
- Improved energy security
- Fuel poverty reduction for local residents and resilience against rising energy prices; wellbeing and health improvements
- Reducing the energy bills of public sector partners
- Supporting economic growth, regeneration and local employment
- Revenue generation
- Shoreham Harbour as a renewable energy hub (Port Authority)
- Reduction in the City's Ecological footprint (BHCC)

1.5 Review of Previous Work

1.5.1 Brighton and Hove Renewable and Sustainable Energy Study

In 2012, AECOM were commissioned by BHCC to deliver a Renewable and Sustainable Energy Study[10] for the City for the period to 2030, with the following agreed scope of work:

- Identify opportunity areas for low and zero carbon energy technologies and establish the viability of heat networks
- Project emissions from new developments over the period of the City Plan and test draft City Plan policies relating to carbon reduction
- Investigate the potential for energy efficiency measures and microgeneration in existing buildings

The report used either existing heat demand consumption data provided by the Council and other stakeholders or, where data was not available, a prediction on energy use was made by utilising CIBSE TM46 benchmarks. The heat mapping exercise resulted in the identification of 14 clusters as areas of opportunity as shown in Figure 2. A heat network opportunity was identified at the Eastern side of Shoreham Harbour however, this area was not considered any further in the study.

This report did not consider the heat and power demands within the nearby ADC area or those associated with nearby development sites (Joint Area Action Plan developments) on the Adur side of the city boundary.

[10] Brighton & Hove Renewable & Sustainable Energy Study (AECOM 2012): http://www.brightonhove.gov.uk/sites/brightonhove.gov.uk/files/downloads/ldf/BrightonandHove_Energy_Study_Jan2013.pdf

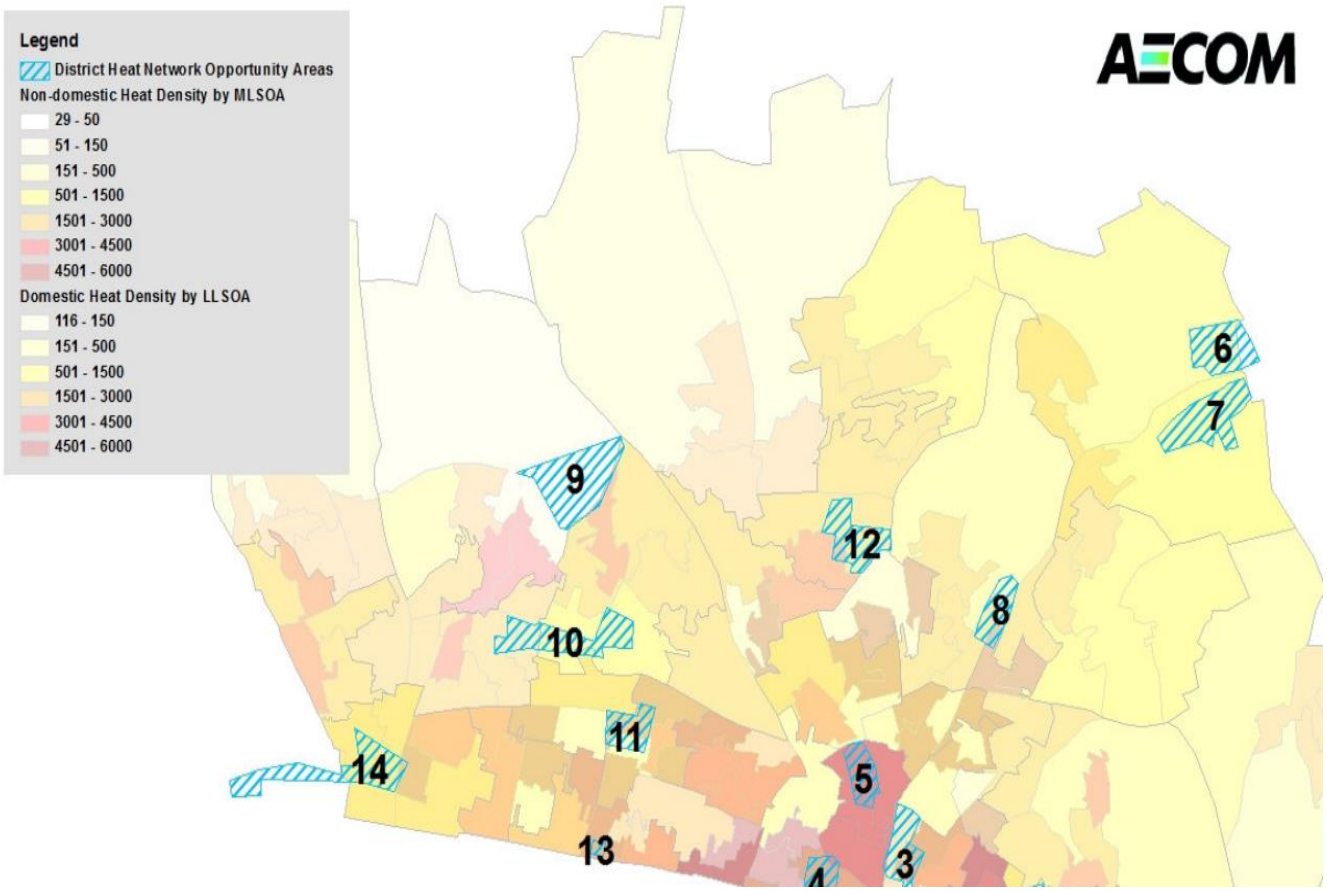


Figure 2: Brighton and Hove heat network opportunities map from Brighton and Hove Renewable and Sustainable Energy Study

1.5.2 Adur District Council Energy Study

In 2009, Element Energy and Ramboll were commissioned by Adur District Council (ADC) along with BHCC, West Sussex County Council (WSCC) and South East England Development Agency (SEEDA) to deliver an Energy Strategy[11] for Adur District and Shoreham Harbour with the following agreed scope of work:

- Develop strategies for achieving low carbon targets within the Shoreham Harbour area
- Identify opportunities for low and zero carbon energy technologies and establish the viability of heat networks
- Identify opportunities for creating low carbon developments
- Inform local policy-making with respect to energy and CO_2 performance of new developments in the Adur District and Shoreham Harbour regeneration area.

The technical and economic viability of two potential district network configurations at Shoreham Harbour were studied as shown in Figure 3. A range of CHP systems were assessed including gas and biomass technologies. For each of these options the economic proposition was generally found to improve as the scale of the system increased, although in all cases the net present value (NPV) was negative.

The scenario which was shown to provide the best economic performance included the whole length of the harbour connecting each of the major development sites. This scenario included a 3.5MWe biomass CHP system and had an NPV of -£2,597,082.

The heat mapping for this study included planned developments that have now been significantly reduced. The data used in this study is therefore out of date and partly inaccurate.

[11] Adur District Energy Study (Element Energy 2009): http://www.adur-worthing.gov.uk/media/media,129655,en.pdf

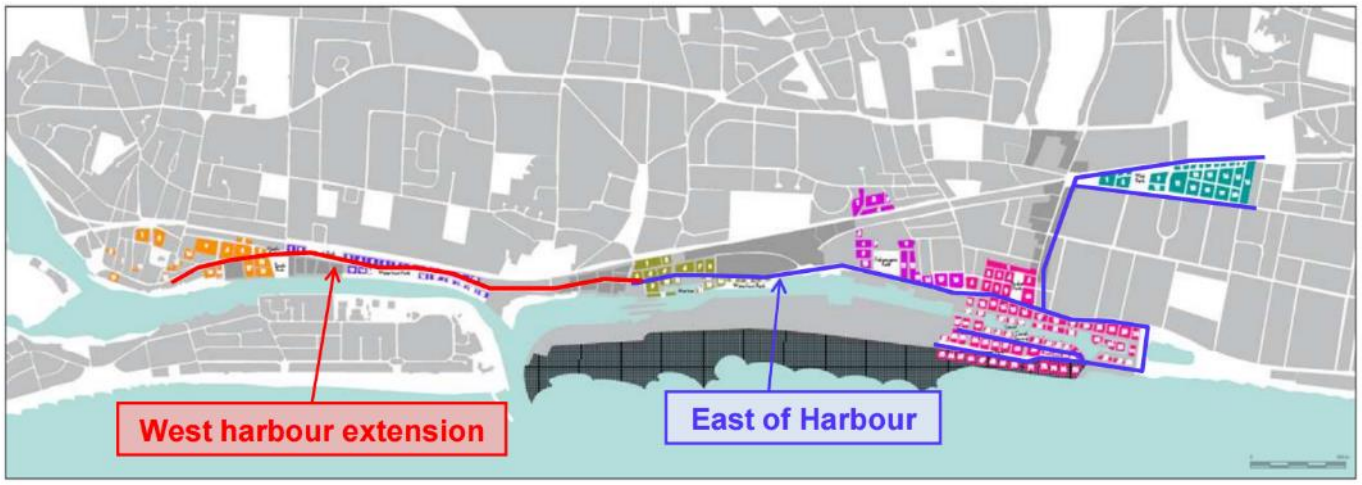


Figure 3: Potential District Heat Network Configurations Studied at Shoreham Harbour from Adur District and Shoreham Harbour Energy Strategy

1.6 Review of the Heat Map Area

The area identified by the project partners to be investigated during the heat mapping exercise extended from the River Adur to the West, the border between ADC and BHCC to the East and Upper Shoreham Road/ A270 to the North with the exception of the Holmbush Shopping Centre.

The consultant team reviewed and provided advice regarding SHRP's proposed heat assessment boundary. After investigations and site visits, the heat map area was revised to ensure that all key potential heat loads were included. This revised heat map area comprises the following:

- Shoreham Airport
- Shoreham Airport Strategic Allocation
- Ricardo Engineering site
- King Alfred Leisure Centre and redevelopment site within The Seafront Development Area (SA1)
- South Portslade and JAAP Strategic Site
- Portslade Council buildings
- Aldrington Basin and JAAP Strategic Site
- EDF offices and nearby social housing

This original and revised heat map areas are shown in Figure 4.

Figure 4: Revised Heat Map Area

2 HEAT MAPPING

2.1 Data Collection

The purpose of the data collection exercise was to enable detailed energy mapping of existing and future heat demands, and potential sources. One of the main project risks associated with the heat mapping exercise was the accessibility of accurate and robust energy data from a diverse range of stakeholders.

In the first instance, an extensive list of potential key heat / power / cooling loads / sources within the heat map area was compiled. This was completed in discussion with clients and stakeholders and after external site inspections.

Energy data, provided by BHCC, ADC, WSCC and Shoreham Port Authority, (that included gas and electricity data for 23 buildings in the heat map area) was then reviewed. All information gaps were identified and a list of required data was compiled (together with an action plan for data collection).

The consultant team presented a bespoke data-collection template to each potential energy user/source. This required provision of information such as key site contacts, historic energy consumption data, half-hourly data (where available), energy and heat meter readings, occupancy levels and patterns, heating set points, heat and cooling processes used on site, production patterns, heating medium and details of waste heat. This was then presented to the stakeholders by email and, where possible, facilitated via telephone calls, face-to-face meetings and workshops.

2.1.1 Data Supplied by Project Partners

The consultant team met with representatives from project partners. Data compiled as a result of the meeting and subsequent telephone and email exchanges is shown in Table 1.

Table 1: Data supplied by BHCC, WSCC and Shoreham Port Authority

Site	Building Name	Annual Gas Consumption (kWh)
BHCC	King Alfred Leisure Centre	3,945,860
	Muriel House	426,868
	Sanders House	302,587
	Knoll House	330,223
	Portslade Town Hall	94,851
	Benfield Primary School	241,691
WSCC	Kingston Buci Children and Family Centre	145,138
	Firestation	102,732
	Southwick Library	27,188
	Stepping Stones Children and Family Centre	73,943
	Glebelands Day Centre	277,363
	Swiss Gardens Primary School	172,181
	Shoreham Beach Primary School	44,136
	Buckingham Park Primary School	155,375
	St Nicolas and St Mary Primary School	151,562
	St Peters Roman Catholic Primary School	37,986
	Herons Dale Primary School	292,255
	Holmbush Primary School	56,069
	Glebe Primary School	241,135
	Eastbrook Primary Academy (North site)	872,411
	Eastbrook Primary Academy (South site)	116,012
Shoreham Port Authority	Nautilus House	60,738
	Quayside House	12,077

2.1.2 Data Received From Other Potential Key Energy Loads

Data provided by other potential energy users is shown in Table 2.

Table 2: Data received from potential key energy users

Building Name	Annual Fossil Fuel Consumption (kWh)
Cemex	59,500
Bartholomew Grain Dryers	1,117,647
Elmcroft Care Home	490,924
Shoreham Police Station	179,941
Higgidy	30,902

A relatively low number of businesses responded to enquires, with a few indicating that they were not interested in the project. Of 74 businesses contacted, 8 responses were received which resulted in 5 businesses sending data. The full list of those contacted is included in Appendix 1 – Building Owners Contacted.

Wherever possible current data was used for the heat demand assessment. Where this was not available, the consultant team verified energy demand profiles using benchmark values as discussed in section 2.1.4.

2.1.3 Planned Developments

In addition to the existing buildings in the heat map area, a large number of additional planned developments that could include potential key heat loads were considered. The consultant team liaised with BHCC, ADC and Shoreham Port Authority and reviewed strategic site maps and development

plans to ensure that future heat demands were modelled to inform network development, phasing and future proofing.

In the context of this study, 'planned development' refers to both: allocated development sites in the proposed Submission Adur Local Plan (2014) and Brighton and Hove Submission City Plan (2013 and 'Further Modifications'). There are also some sites in addition to these that are unallocated development sites from other background evidence documents. This means that future development of these sites is not certain or guaranteed.

The key planning documents reviewed were:

- Joint Area Action Plan[12] (JAAP)
- Adur and Worthing Councils Strategic Housing Land Availability Assessments[13] (SHLAA)
- Brighton & Hove City Council SHLAA[14]
- Brighton & Hove City Plan[15]
- Adur Local Plan[16]
- Shoreham Port Masterplan[17]
- Development Briefs
- Planning Applications
- Recent planning permissions

The planned developments within the heat map area have been split into three stages:
Stage 1 – including planned developments likely within the next 5 years
Stage 2 – including planned developments within the next 5 to 10 years
Stage 3 – including planned developments within the next 20 years

These planned developments are detailed in Table 3 and their locations shown in Figure 5.

[12] Draft JAAP report: http://www.adur-worthing.gov.uk/media/media,121462,en.pdf
[13] SHLAA report: http://www.adur-worthing.gov.uk/media/media,127921,en.pdf
[14] Brighton & Hove SHLAA report: http://www.brighton-hove.gov.uk/sites/brighton-hove.gov.uk/files/SHLAA%20Update%20June%202014%20FINAL.pdf
[15] Brighton and Hove City Plan: http://www.brighton-hove.gov.uk/content/planning/local-development-framework/city-plan
[16] Adur Local Plan: http://www.adur-worthing.gov.uk/adur-local-plan-2014/
[17] Shoreham Port Masterplan: http://www.shoreham-port.co.uk/write/documents/Consultation%20Report%208%20November%202010.pdf

Table 3: Planned development sites

Ref.	Planned Development	Building Use	Source of information	Modelled Annual Consumption (kWh)	Potential date of completion	Stage
1	Shoreham Airport development	Offices, workshops, storage	Adur Local Plan 2014: Policy 7, page 43-47	1,373,603	2020	1
2	Grazing land south west of flyover[18]	Mixed use	SHLAA ref: ADC/111/13	891,465	2020	1
3	Ropetackle North	Residential, offices, hotel, cafe and retail	Planning ref: AWDM/0935/13 Planning approved: 12/06/2015	1,539,148	2020	1
4	Pond Road development	Health centre, library, offices and residential	SHLAA ref: ADC/086/13 and Pond Road Development Brief	819,663	2020	1
5	Adur Civic Centre car park development	Offices	SHLAA ref: ADC/052/13	307,330	2020	1
6	Adur Civic Centre development	Offices and residential	SHLAA ref: ADC/059/13	1,343,517	2020	1
7	Western Harbour Arm, Stage 1	Residential and retail	JAAP Strategic Site 4; Western Harbour Arm	17,390,072	2020	1
8	Western Harbour Arm Stage 2	Retail and residential	JAAP Strategic Site 4; Western Harbour Arm	3,194,728	2025	2
9	Southlands Hospital site	Residential	Planning ref: AWDM/1340/14 Planning approved: 10/02/2015	1,820,681	2020	1
10	Western Harbour Arm Stage 3	Residential	JAAP Strategic Site 4; Western Harbour Arm	2,690,864	2035	3
11	Lidl development	Supermarket	Planning ref: AWDM/0431/14 Planning approved: 27/01/2015	226,941	2020	1
12	Lady Bee Marina development	Offices, workshops	JAAP Strategic Site 3; Southwick Waterfront	394,941	2020	1
13	Land adjacent to Eastbrook Academy	Residential	SHLAA ref: ADC/119/13	630,068	2020	1
14	Former Eastbrook Allotments	Offices and workshops	SHLAA ref: ADC/138/13	658,762	2020	1

[18] This site was considered unsuitable for residential development in the SHLAA and wasn't included as an allocation in the Proposed Submission Adur Local Plan 2014.

15	South Portslade	Residential, retail and offices	JAAP Strategic Site 2; South Portslade	5,320,615	2020	1
16	Aldrington Basin	Residential, retail and offices	JAAP Strategic Site 1; Aldrington Basin	1,083,042	2020	1
17	King Alfred Leisure Centre development	Leisure centre, residential and retail	King Alfred Leisure Centre/RNR site Informal Planning Advice Note October 2014	8,535,792	2020	1

Figure 5: Map of planned development site locations

There are a number of risks associated with energy mapping for, and basing network assumptions around, planned developments and these include:

- The planned development not coming forward - there is no certainty as to whether all of the sites will come forward or that planning permission will be granted for development particularly as some sites face major constraints
- Permitted development not being built out
- Changes to the nature, scale and timing of particular developments
- Connection risk - the developers not engaging with the heat network process and/or the potential network provider so that new buildings are not 'network-ready' or do not connect to an existing network

These risks are considered further in section 4.

Conversely, there may be potential for the density of developments to increase and this increased linear heat density could increase the size of the opportunity and the viability of networks.

2.1.4 Fossil Fuel Consumption Benchmarking

Where suitable site contacts could not be made, where appropriate data was unavailable and for planned development sites, non-domestic building and industrial benchmarks were used to verify the expected fossil fuel consumption to be used in energy profiling. These were taken from *CIBSE Guide F, Energy Efficiency in Buildings* (2008) and *CIBSE TM46* (2008)[19]. The fossil fuel consumption value was calculated using gross floor area determined from the site operator or satellite mapping software.

A tried and tested approach was then used to generate demand profiles verified by the benchmarked fossil fuel consumption, building type and use. The consultant team has a database of hundreds of hourly annual demand profiles for a wide range of building types and these were adapted to provide an indicative heat demand profile for each site.

2.1.5 Electricity Consumption Benchmarking

For consideration of private wire arrangements, electricity profiles were derived from actual data wherever possible. Where data was unavailable benchmarks from *CIBSE Guide F, Energy Efficiency in Buildings* (2008) and *CIBSE TM46* (2008) were used to verify consumption.

2.2 Heat Demands

Annual fossil fuel consumption values (from historical site data) and benchmark calculations were used to determine an annual heat demand value for each potential key heat load within the heat map areas. Where information was not available for heating plant, a nominal boiler efficiency of 75% was used to allow for energy losses during the conversion of consumed fossil fuel to useful heat output. For planned developments a nominal improved boiler efficiency of 85% was used. The calculated annual heat demand values for each building are listed in Appendix 2 – Energy Data.

2.2.1 Heat Demand Profiling

In order to further analyse heat demands at each of the sites, hourly heat demand profiles were constructed. For the sites with hourly consumption data available, the heat demand profiles were constructed from the historical data (whilst allowing for heating plant efficiency). Where the existing fossil fuel data for a building was obtained as an annual figure, or the heat demand was verified by means of benchmarking (such as for planned developments), an hourly heat demand profile was created. The profiles were generated using in-house modelling software which apportions the annual heat demand figure into hourly loads over the year, taking into account degree day data for the area and building use and occupancy.

[19] The risks associated with using this data to verify heat demands is discussed in 4.2 – Issues and Risks.

For each building/site, the annual demand model was then used to identify the average, maximum and minimum hourly demand throughout the year. An example average, maximum and minimum heat demand profile is shown in Figure 6 (for Laylands Court building 2). Laylands Court is part of Laylands Road Housing Estate which comprises of 14 social housing buildings owned by Adur Homes.

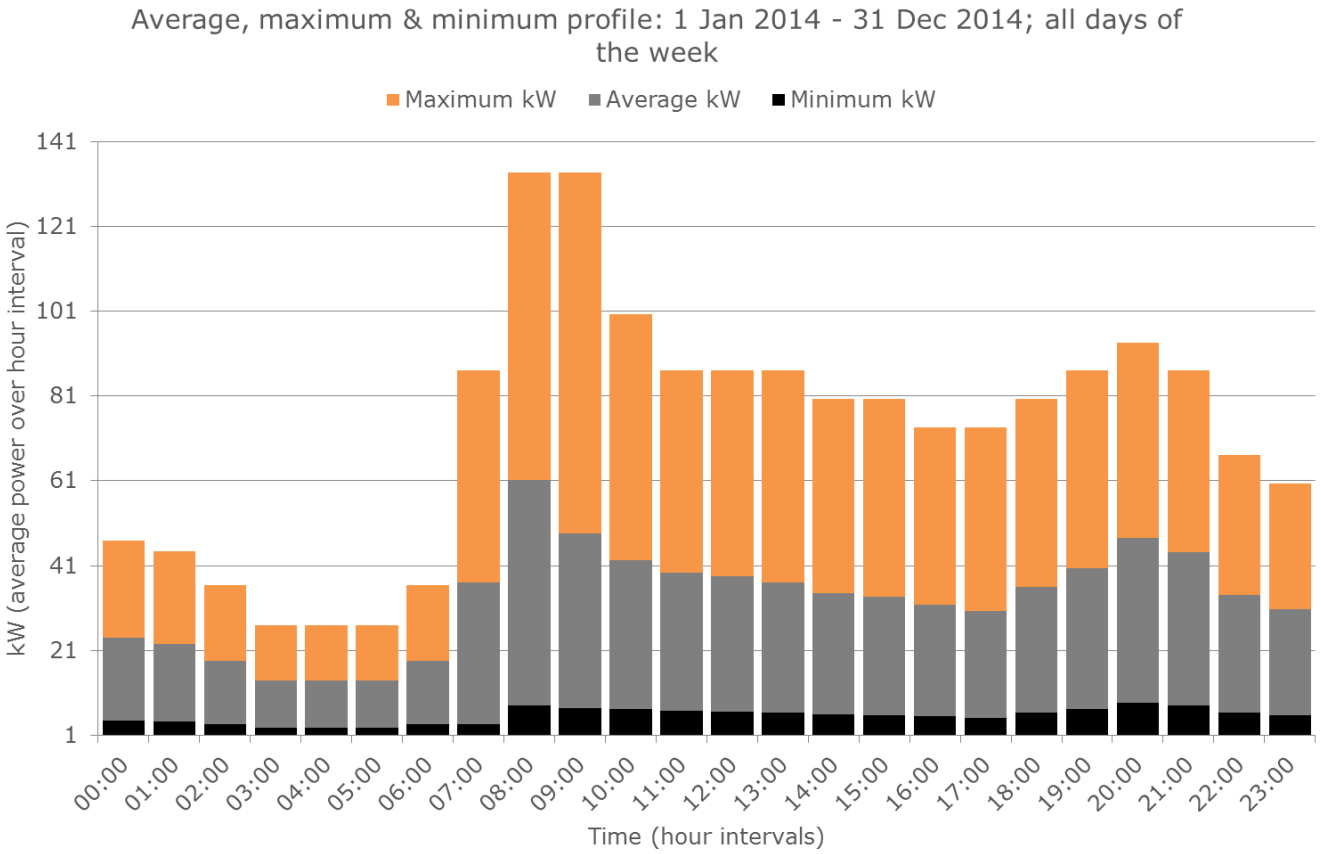


Figure 6: Annual Heat Demand Profile for Laylands Court, Building 2

The profiles of typical winter and summer days were also produced to identify the demand variation on both a day-by-day and seasonal basis. The typical winter and summer profiles for Laylands Court building 2 are shown in Figure 7 and in Figure 8. The orange, grey and black lines correspond with the maximum, average and minimum demands respectively.

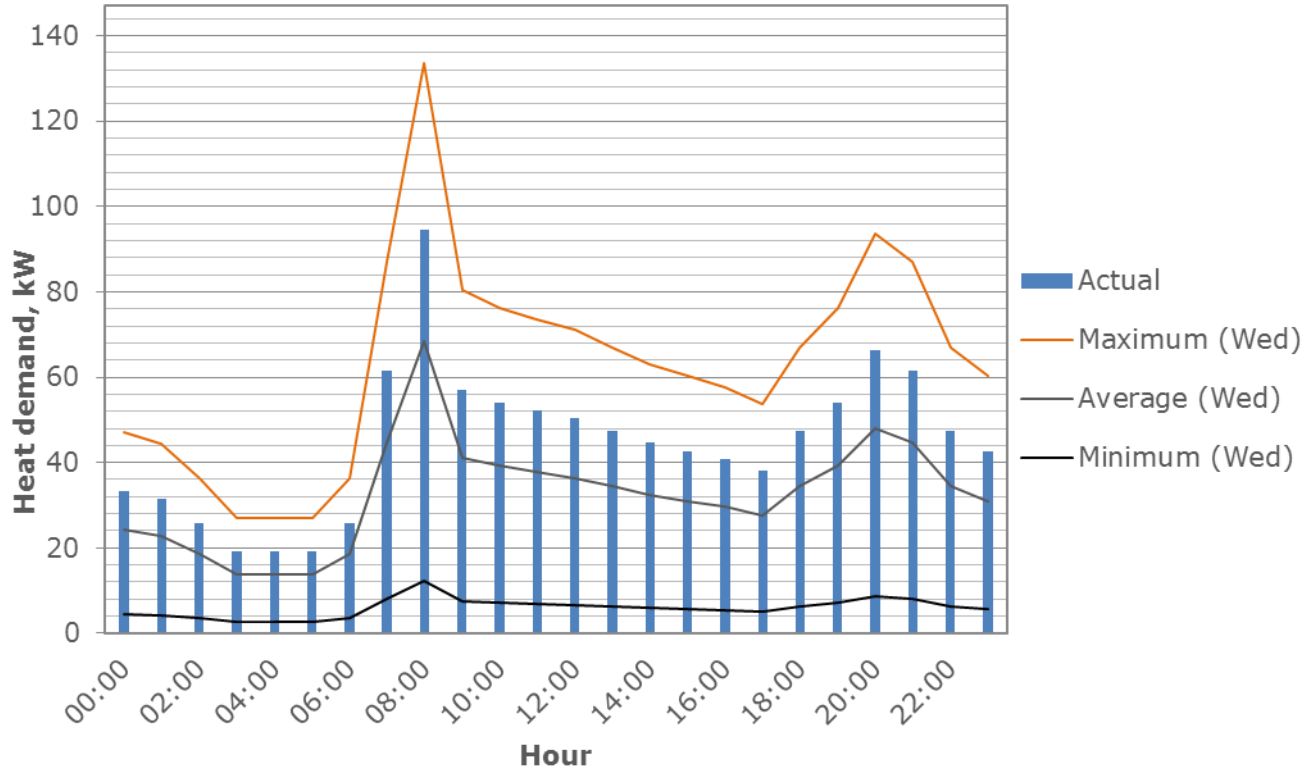


Figure 7: Daily Heat Demand Profile for Laylands Court, Building 2 for 1st January 2014

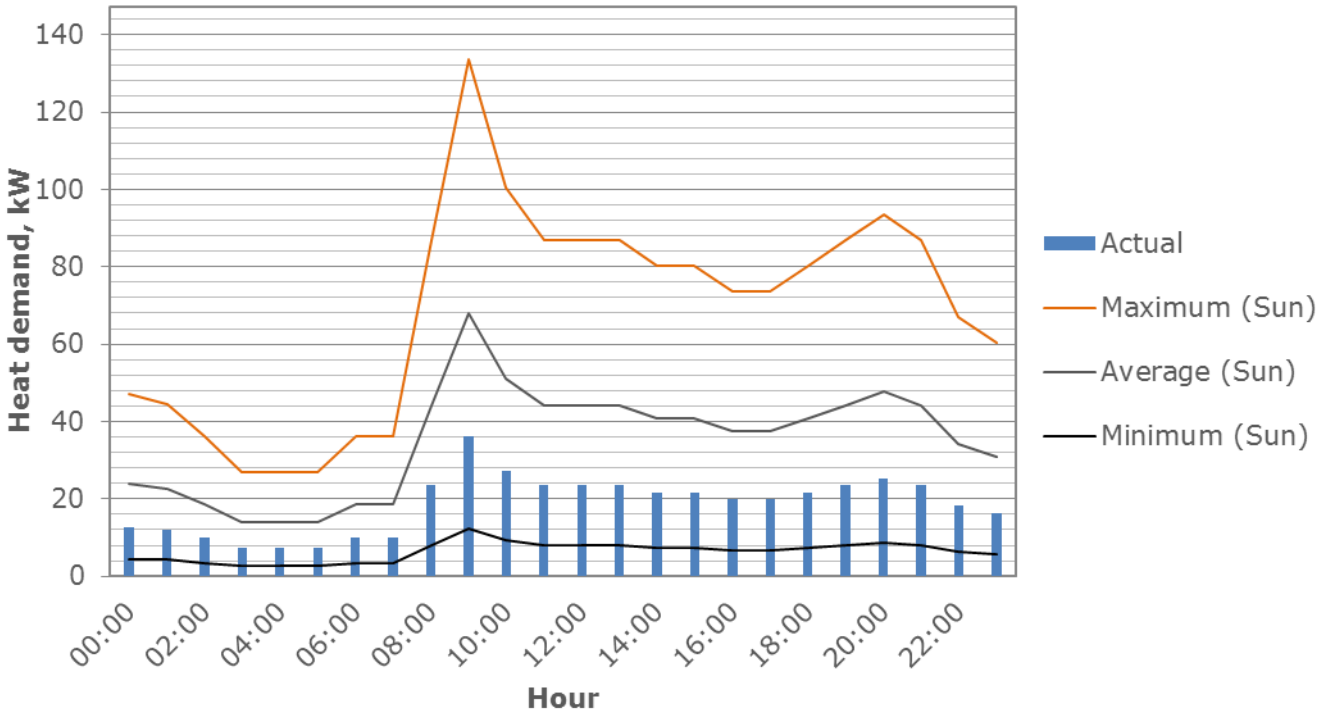


Figure 8: Daily Heat Demand Profile for Laylands Court, Building 2 for 1st June 2014

2.3 Heat Mapping Results

Geographic Information System (ArcGIS) software was used to map the identified key heat demands across the Shoreham Harbour area (see Figure 9). The symbols show the site location and graduate in size according to heat demand to depict the spread and intensity of key heat loads within the heat map area. The larger the symbol, the greater the heat demand. The existing heat loads are shown in red with planned developments stages 1, 2 and 3 shown in green, yellow and blue respectively. Assumptions as to phasing of planned development sites have been made for the purposes of modelling heat demand and are shown in predicted timescales based on relevant plans (as set out in 2.1.3 – Planned Developments). The heat demands for all buildings can be found in Appendix 2 – Energy Data.

The majority of heat demands are located to the north of the River Adur and canal basin. The areas south of the canal have relatively low heat demands and densities. The planned developments along the Western Harbour Arm have the highest potential heat density and other potential key heat loads include the King Alfred Leisure Centre planned redevelopment, 79-81 Brighton Road and Shoreham Academy.

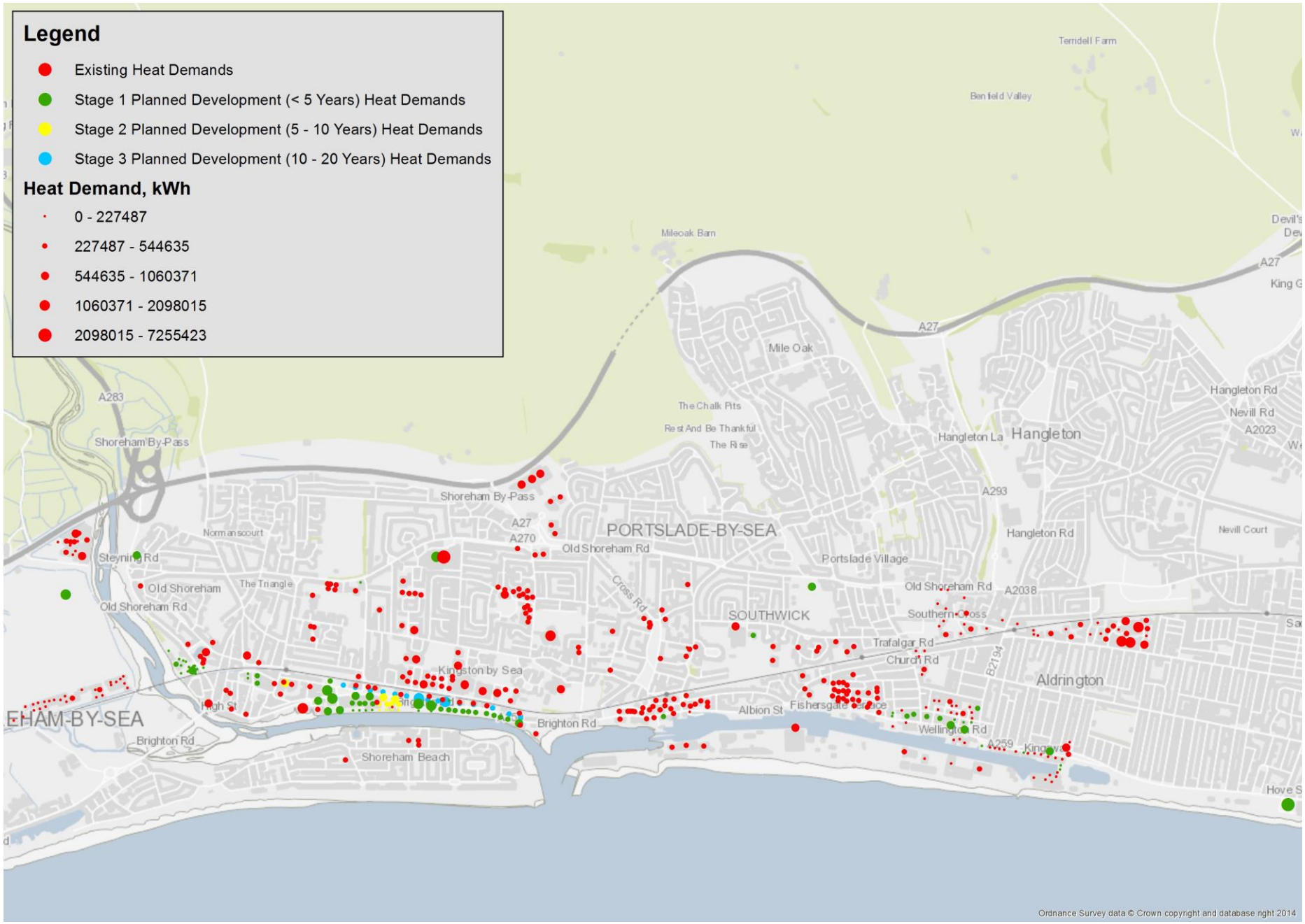


Figure 9: Heat Map for Shoreham Harbour area

2.4 Cooling Demands

No large telephone exchanges or data centres were identified within the heat map area and, of those sites where contact was successfully made, no significant cooling demands were identified. A small BT telephone exchange (serving 7,815 residential properties and 478 non-residential properties) was identified at Tarmount Lane, Shoreham-by-Sea. External site inspection revealed no significant cooling plant and the cooling demand is deemed likely to be low.

External site inspections and consideration of business types do not indicate any major cooling loads although businesses in the retail and food sectors (such as Tesco, Marks and Spencer, Co-op, Higgidy and Southover Foods) have some refrigeration requirements that could be contributed to by indirect fired absorption chillers that utilise hot water from a heat network.

There are also some potential cooling demands within the planned developments such as the proposed hotel at Ropetackle North, mixed use redevelopment of the Adur Civic Centre site and a Lidl supermarket alongside the A259, however these are small sites with small associated cooling demands. If the project is progressed to the feasibility stage and further engagement with key business achieved, then this opportunity should be further investigated.

2.5 Existing Heat Sources

Existing heat sources with potential to supply networks at the subject sites that were investigated included waste industrial heat, biomass heat, EfW plants, existing networks, anaerobic digestion, water, ground and air source heat pumps and deep geothermal energy.

Two large potential heat sources were located namely, Shoreham Power Station and the planned Edgeley Green Power Station. A small biomass boiler was also located at Shoreham Academy.

Shoreham Power Station
Shoreham Power Station (SPS) is an existing power station of 420 MW electrical capacity[20]. It was commissioned in 2000 with a 25 year design life, thus is expected to be decommissioned in 2025. The client has previously achieved very little engagement with Scottish Power and both the client and consultant team made unsuccessful attempts to establish contact with the organisation as part of this study. The consultant team reviewed the Adur and District Council Energy Study (2009) and received reliable anecdotal evidence on the current operation of the plant. There are a number of key issues surrounding the security of the heat supply from SPS:

- The power station is a single shaft unit, therefore any repairs or reconfigurations require the whole station to be shut down and this will have implications for continuity of supply.
- The normal operating cycle can allow the power station to run for 350 days per year. However, the plant is used for peak demands and operates at a low level outside of peak electricity demand periods. The heat generation would therefore be highly variable and is likely to be limited to <1,000 hours per annum severely affecting continuity of supply.
- The operating schedule depends heavily on current gas and electricity prices. Scottish Power may choose to take the power station offline at any time.
- The plant is scheduled to be decommissioned by 2025 and so does not offer a secure heat source for any phased network developments. In this study the phase 1 networks could be developed by 2020 with numerous other phases to be potentially developed after 2025.
- As part of the power generation process at SPS, when the steam leaves the steam turbine it is condensed using sea water and hot water is generated at less than 50°C. Significant changes would need to be made in order to provide heat at the higher temperature (~80°C) potentially required by the proposed networks.
- Assuming SPS significantly increases operating hours and can provide hot water at the required temperature, of the network routes proposed in Chapter 3, all the scenario A phases and phases 2-5 described in scenario B would be able to receive heat from SPS. However, the cost of the heat offtake and the cost of the heat itself will have major implications for the viability of the network.

[20] Shoreham Power Station, Scottish Power: http://www.scottishpower.com/pages/shoreham_power_station.asp

The low utilisation and scheduled decommissioning date of this peaking plant means that, unless there are significant changes in operation, SPS cannot been considered as a reliable potential heat source.

2.6 Edgeley Green Power Station

Edgeley Green Power Station (EGPS) is a proposed renewable heat and power generation facility at Shoreham Port, as shown in Figure 10. Planning permission was granted in February 2014[21] and construction is due to begin late 2015 on a site adjacent to the existing Shoreham Power Station. It is planned that Edgeley Green will be fuelled by various biofuels including used cooking oils, glycerine, animal tallow, an oil derived from the production of wood pulp manufacture and crude and refined vegetable oils which are deemed unfit for human consumption. These oils will be transported to the site in bulk by sea. The plant has the potential to generate approximately 32 MW of electricity and approximately 25 MW of heat.

There is significant potential for EGPS to provide heat to a network via a pipe route under the canal. This requires access to a tunnel that is currently utilised and leased by Scottish Power. EGP has held negotiations with Scottish Power and has received assurances around accessing the tunnel to facilitate heat offtake. The risks associated with EGPS are discussed further in section 4.

Figure 10: Proposed Edgeley Green Power Station[22]

EGP are seeking to certify the scheme as Good Quality CHP[23] and, in order to do so, are required to deliver a quantity of useful heat to a network. If a specified quantity of useful heat can be provided to a heat network then CHPQA certification will allow EGP to claim some significant benefits:

- An uplift from 1.5 to 2 ROCs per MWh of output generation
- Enhanced Capital Allowances (ECAs)
- Exemption from the Climate Change Levy (CCL) for fossil fuels bought and CHP power sold
- Potential business rates exemptions

[21] Refer to planning application AWDM/0868/12
[22] Image from: http://www.edgeleygreenpowershoreham.co.uk
[23] CHPQA (Combined Heat & Power Quality Assurance) is a voluntary UK government scheme to encourage the development of Good Quality CHP Schemes).

2.7 Identification of Clusters

The heat mapping exercise identified heat demand clusters that could potentially become part of a network. The larger heat demands were identified and these key heat loads were then assessed with regard to the surrounding heat density and proximity to other demands. Areas of higher heat density provide a greater annual load whilst minimising capital costs and heat loss on distribution pipework. The cluster boundaries were also influenced by obvious physical obstructions such as major roadways, built-up areas and areas with special engineering difficulty.

Within the heat map area 35 clusters were identified. These are listed in Table 4 and shown in Figure 11. Two additional clusters, 36 and 37, were identified for planned development stages 2 and 3 which are likely within the next 10 and 20 years respectively. These are also listed in Table 4. The location of clusters 36 and 37 can be seen by the yellow and blue heat demands in Figure 9 respectively.

Table 4: Cluster identification

Cluster Number	Cluster Name	Annual Heat Demand, kWh	Annual Electricity Demand, kWh
1a	Ricardo and Airport development	6,161,273	1,369,476
1b	Grazing land development and Tollbridge House	894,089	503,870
2	Shoreham Airport	2,394,906	1,223,438
3	Ropetackle North	2,356,679	982,197
4	Homehaven Court and Swiss Gardens	1,374,536	371,604
5	Shoreham High Street	1,042,579	739,517
6	Pond Road	980,823	211,019
7	St Pauls Lodge and Cecil Norris	817,212	194,102
8	Ham Road	1,108,552	1,435,536
9	Western Harbour Arm - West	7,085,437	2,503,354
10	Western Harbour Arm - Centre	3,123,347	817,231
11	Palace Drinks and Paladone	605,623	666,274
12	Rosslyn Court	1,084,453	257,576
13	Buckingham Park and St Nicolas & St Mary	807,588	359,398
14	Southlands Hospital	3,645,594	858,107
15	Elmcroft Care Home and Housing	1,073,996	413,911
16	Kingston Buci Centre and Cavell House	660,491	182,694
17	Dolphin Road and North of Brighton Road	7,933,806	7,367,415
18	Western Harbour Arm East	8,085,353	3,088,972
19	Holmbush Centre	2,970,964	12,143,513
20	Wilmot Road Housing	3,046,534	729,390
21	Shoreham Academy	1,562,004	482,100
22a	Shoreham College	968,426	263,703
22b	Ashcroft and Marsh House	822,695	195,404
23	Southwick Waterfront	5,575,530	2,338,791
24	Southwick	496,294	111,080
25a	Manor Hall Road - West	1,679,776	511,757
25b	Manor Hall Road - East	1,106,471	318,847
26	Fishergate	4,894,988	1,823,011
27	Basin Road South - West	955,759	70,797
28	Basin Road South - East	899,120	656,216
29	South Portslade existing	2,031,570	1,091,062
30	South Portslade development	4,522,522	1,595,250
31	Aldrington Basin	3,133,080	1,538,771

32	Church Road	823,175	172,905
33	Victoria Road	2,079,198	2,294,922
34	EDF Offices and Portland Road	9,626,167	3,011,062
35	King Alfred Leisure Centre development	7,255,423	2,364,273
36	Planned developments stage 2	2,715,519	720,365
37	Planned developments stage 3	11,329,149	2,690,864

Conclusions
The fourteen clusters with the most significant heat demands are:

- Ricardo and Airport development (1a)
- Western Harbour Arm – West (9)
- Western Harbour Arm – Centre (10)
- Southlands Hospital (14)
- Dolphin Road and North of Brighton Road (17)
- Western Harbour Arm East (18)
- Wilmot Road Housing (20)
- Southwick Waterfront (23)
- Fishergate (26)
- South Portslade development (30)
- Aldrington Basin (31)
- EDF Offices and Portland Road (34)
- King Alfred Leisure Centre development (35)
- Planned developments stage 3 (37)

These are mainly concentrated along the north side of the A259 with a number of outlying areas and this will be clearly evident in the network route masterplan.

Figure 11: Cluster identification

3 MASTERPLANNING & PRIORITISATION

The outputs from the heat mapping exercise were considered to identify potential network opportunities for the heat map area. In order to investigate all eventualities, potential network opportunities have been assessed for two scenarios where:

A. EGPS goes ahead as planned
B. EGPS does not go ahead

The potential networks and subsequent analysis for scenario A were divided into three phases. The potential networks and subsequent analysis for scenario B were divided into five phases. Phases were identified according to financial and technical viability and the timing of potential key developments (to 2035)[24].

To model the viability of the scenarios, hourly heat demand profiles for each building were added together to produce a combined heat demand for each hour of the year. An hourly heat loss figure (based on pipe size and heat loss rates for pre-insulated steel pipe) was added to the combined profile, with the assumption of constant heat loss through the network.

The model also involved a simulation of the hourly heat demands for the network options being provided by Edgeley Green Power Station for scenario A and alternative viable energy sources for scenario B. Financial cases were then produced for each technology, identifying those that were technically and financially feasible. These options were then further considered.

Indicative pipe routes were designed with maximum cost-efficiency, by minimising pipe length and following pavement and soft verges where possible. At this stage it was assumed that the trench used by the distribution pipe could also contain the cable for electricity distribution for private wire arrangements[25].

The network phases for scenario A are detailed in section 0 and the network phases for scenario B in section 3.3. Full financial figures for each of the technology appraisals are shown in Appendix 6 – Financial Viability Assessments and Network Costs. The pipe sizes and specifications for each phase are also shown in Appendix 6.

Linear heat density is considered to determine the most appropriate loads and network routes. Network route selection methodology involves consideration of linear heat density of clusters and, for potential clusters, the impact that pipe routes and connections have on the high level financial and technical viability (considering heat demand, peak, pipe size, diameter and length, losses, ground conditions and physical barriers).

3.1 Technology Appraisal Assumptions

Table 5 shows the parameters used for the financial assessments and the sources of this data.

Table 5: Parameters used in financial assessments

Parameter	Value	Source of Data
Unit price for heat sales (£/MWh)	35	Competitive tariffs based on information received from the client team and businesses (mainly for 2014)
Electricity price day (£/MWh)	10	
Electricity price night (£/MWh)	65	
Electricity price export (£/MWh)	45	Current market value
Cost for biomass fuel (£/MWh)	35	Current market value
Cost for gas fuel (£/MWh)	25	Current market value
Cost of heat from Edgeley Green Power Station (£/MWh)	5	High level assumption based on discussions with EGPS
Carbon value (£/tonne)	16	Current CRC value
CCL charge (£/MWh)	1.93	Current charge

[24] N.B. Scenario A and B phases are not equivalent i.e. Scenario A Phase 2 is not the same network as phase 2 in scenario B.
[25] This would usually be in ducts that allow cables to be pulled after the excavation work is complete.

Efficiency of biomass	80%	Experience of operating plant
Efficiency of auxiliary gas	85%	Experience of operating plant
Plant parasitic load (as % of Σ heat generated)	2%	Experience of operating plant
RHI value	Current	Non-domestic RHI tariffs, Ofgem
NPV (%)	3.5%	Treasury Green Book
Energy price increases	2.5%	Nominal value considering trends

3.2 Scenario A: Edgeley Green Power Station

All of the phases in Scenario A assume EGPS is the existing heat source. The high level financial cases for the Scenario A appraisals assume that heat is provided to the networks at a fixed cost of £0.005 / kWh and is based on the capital cost for developing the network and an auxiliary plant only. It does not include the cost of developing EGPS. After discussions with Mike Reynolds at EGP it has been assumed that 25 MWh of heat is provided to the network for 8,064 hours a year, with 4 weeks of shut down for maintenance. During maintenance periods mains gas fuelled auxiliary / peak and reserve plant will be required to provide heat to the network.

3.2.1 Scenario A, Phase 1

The Network
The phase 1 network is shown in Figure 12 and a summary of the network is provided in Table 6.

Table 6: Scenario A, Phase 1 network summary

No. heat loads	Trench length	Total heat demand	Peak heat demand	Heat losses[26]	Key heat loads	Date
201	12.5km	57,003 MWh	22 MW	12%	- Western Harbour Arm Flats 1, 2, 9, 10, 21 planned developments - Adur Civic Centre development - South Portslade residential development 1.1 - Vega social housing	2020

The largest pipes (flow and return up to DN400[27]) would extend along the A259 and the associated trench width would be approximately 2.5m. The theoretical network has been futureproofed and costed to serve future developments and expansion opportunities up to Phase 3 and so this would be the largest pipe size and trench width for all phases.

[26] Heat losses have been calculated using the pipe specification figures shown in Appendix 6 based on the type, diameter and length of pipe and insulation thickness. Heat losses are shown as a percentage of the total phase heat demand.
[27] This refers to the 'Diameter Nominal' – 400mm diameter steel pipe.

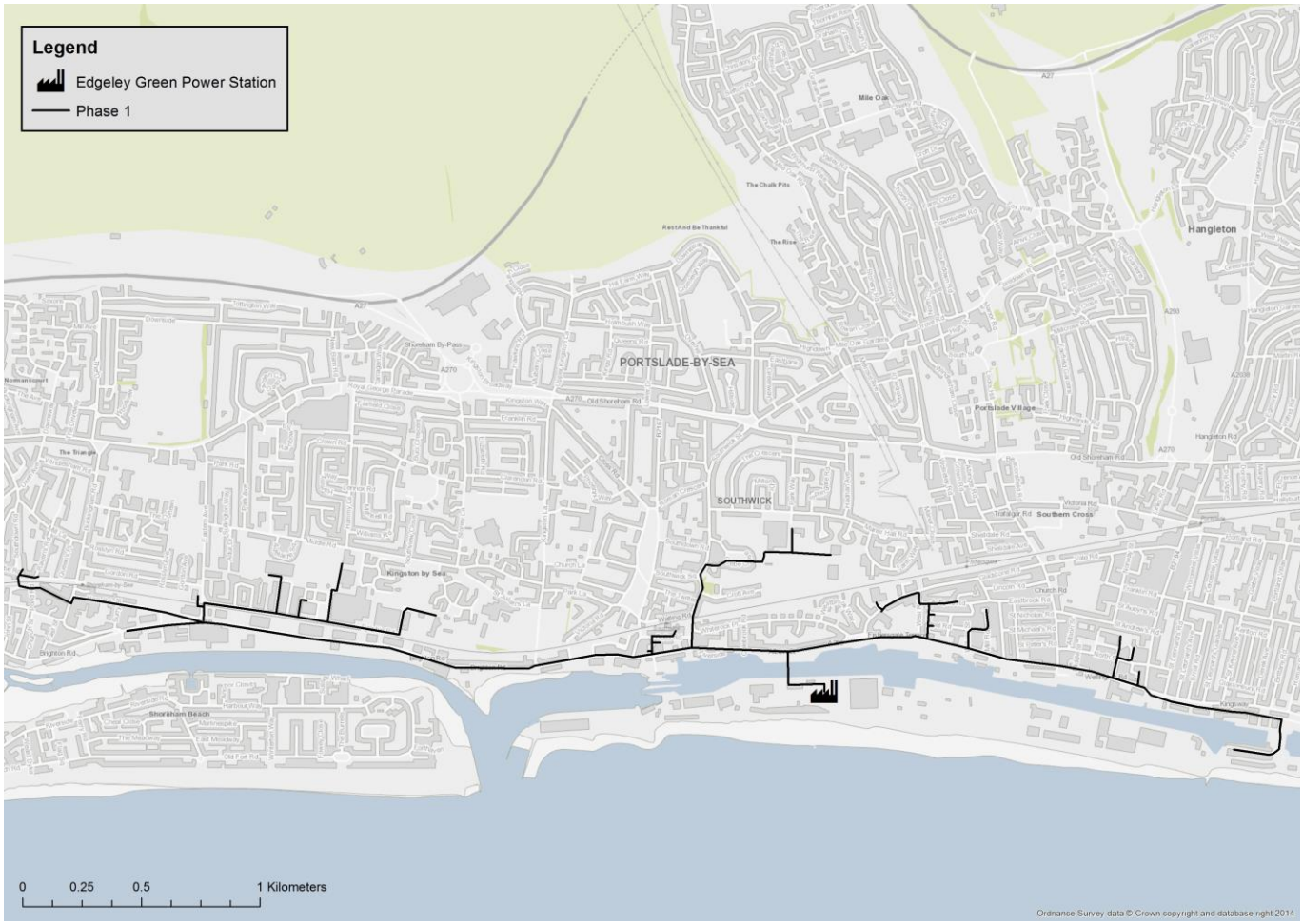


Figure 12: Scenario A phase 1 pipe route and Edgeley Green Power Station location

Figure 13 and Figure 14 show the phase 1 potential key heat load locations, ownership, heat demands and pipe route. Table 7 lists the heat demands numbered in the figures.

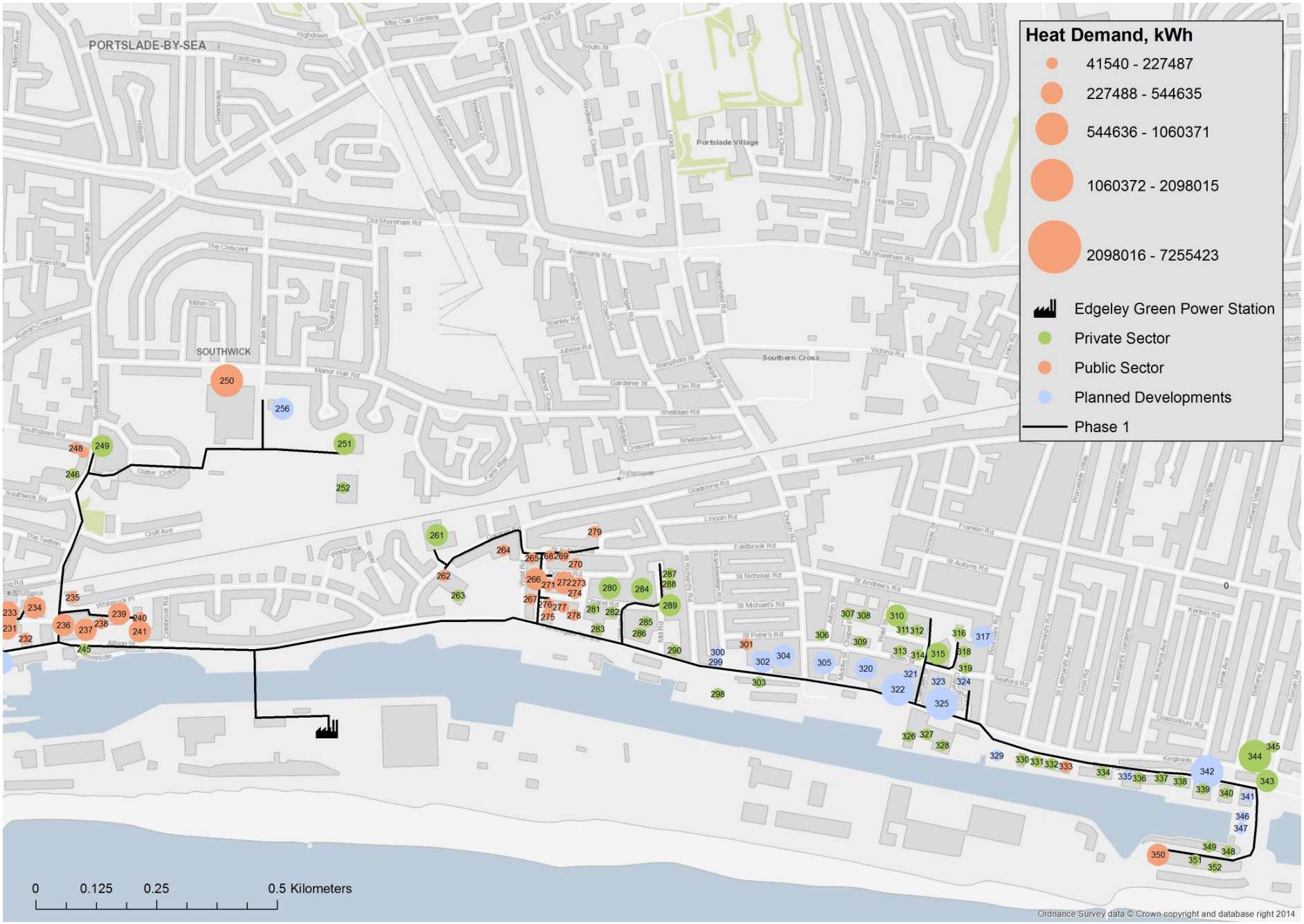


Figure 13: Eastern section of scenario A phase 1

Figure 14: Western section of scenario A phase 1

Table 7: Heat load identifications for scenario A phase 1

Site ID	Building Name	Site ID	Building Name
72	Shoreham Centre, Community Centre	239	Sea House
73	Shoreham Centre, Council Offices	240	Harbour Court
74	Pond Road, Community Building	241	Albion House
75	Pond Road, Residential	242	Dudman Offices
76	Cecil Norris House	243	Nautilus House, Port Authority Offices
77	St Paul's Lodge	244	Southwick Waterfront, Lady Bee Marina
78	Royal Mail Delivery Office	245	Old Town Hall
79	Tarmount Lane, telephone exchange	246	PB Law solicitors
80	Police Station	247	Doctors Surgery, Manor Practise
82	Coop, Ham Road	248	Southwick Library
83	Pashley Court	249	Southwick Community Association
84	Riverside Business Centre, 12 units	250	Eastbrook Primary Academy (North site)
86	Adur Civic Centre	251	Leisure Centre
87	Adur Civic Centre Car Park	252	Indoor Bowling Club
88	Western Harbour Arm Flats 1	256	Land Adjacent to Eastbrook Academy
89	Western Harbour Arm Flats 2	261	Nyenex House
90	Western Harbour Arm Flats 3	262	Stepping Stones Children Family Centre, Council Health Centre
91	Western Harbour Arm Flats 4	263	Community Centre Fishergate
92	Western Harbour Arm Flats 5	264	Eastbrook Primary Academy (South Site)
93	Western Harbour Arm Flats 6	265	Westlands Court, building 1
94	Western Harbour Arm Housing 1	266	Westlands Court, building 2
95	Western Harbour Arm Housing 2	267	Westlands Court, building 3
96	Western Harbour Arm Housing 3	268	5-8 Laylands road
97	Western Harbour Arm Housing 4	269	Wyck Court, building 1
98	Western Harbour Arm Employment 1	270	Wyck Court, building 2
99	Western Harbour Arm Employment 2	271	Laylands Court, building 1
100	Western Harbour Arm Employment 3	272	Laylands Court, building 2
101	Western Harbour Arm Employment 4	273	Laylands Court, building 3
102	Palace Drinks	274	Laylands Court, building 4
103	Dunelm Mill	275	Old Mill Close, building 1
104	McDonalds, Eastern Avenue	276	Old Mill Close, building 2
105	Halfords	277	Old Mill Close, building 3
106	Paladone	278	Old Mill Close, building 4
128	Glebelands Day Hospital	279	Summer Close
129	Kingsland House Care Home	280	Big Box Self Storage
130	Warehouse, 13 Dolphin Road	281	Tungsten Buildings, 12 units
131	Warehouse behind 13 Dolphin Road	282	Greg Stone, flooring
132	To let, previously PaperLinx	283	R&D Goatley Ltd
133	5 Industrial Units, Dolphin Way	284	Kew Electrical
134	House of Hugo	285	Chapel Road, Warehouse units
135	Gemini Press Printers	286	Johnsons Apparel Master
136	Gemini Press Warehouse	287	Mill Road Industrial Estate
137	Dolphin Enterprise Centre, formerly Edwards	288	Adams Packaging
138	Dolphin Enterprise Centre, D, 4 units	289	Southdown Construction Ltd, Fishergate Forge
139	Dolphin Enterprise Centre, C, 8 units	290	The Adenstar Group offices
140	Dolphin Enterprise Centre, B, 8 units	298	Cemex
141	Edgars, Dolphin Enterprise Centre, A, 4 units	299	South Portslade, residential 5.1
142	DAF	300	South Portslade, residential houses next to 5.1
143	Unknown Warehouse, behind DAF	301	St Peter's Community Primary School
144	Hall Business Centre	302	South Portslade, residential 4.1
145	Infinity Foods Coop	303	CP Mechanical Designs Limited
146	VW Heritage	304	South Portslade Industrial Redevelopment, A
147	Higgidy	305	South Portslade Industrial Redevelopment, B
148	Pyroban	306	London & Brighton Plating

Site ID	Building Name	Site ID	Building Name
149	G3 Business Park, Units 11-12	307	Jewson
150	G3 Business Park, Units 1-7	308	Jewsons Warehouse
151	G3 Business Park, Units 8-10	309	Offices, 2 North Street
152	B&Q	310	Eurovans Brighton
153	The Cyril Richings Business Centre, 4 units	311	D W Electrical
154	Screw fix	312	Iveco
155	Howden's Joinery Co.	313	Unknown Offices, North Street
156	Travis Perkins Timber & Building Supplies	314	Display House
157	City Plumbing Supplies	315	City Coast Church
158	To let, warehouse opposite Howard Kent	316	Offices, East Street
159	RNLI Lifeboat station	317	South Portslade, residential 2.1
160	Lidl Development	318	Warehouse, East Street
161	Western Harbour Arm Employment 9	319	Offices, North Street
162	Western Harbour Arm Employment 10	320	South Portslade Industrial Redevelopment, C 1
163	Western Harbour Arm Flats 9	321	South Portslade Industrial Redevelopment, C 2
164	Western Harbour Arm Flats 10	322	South Portslade, residential 3.1
165	Western Harbour Arm Flats 11	323	South Portslade Industrial Redevelopment, D
166	Western Harbour Arm Flats 12	324	South Portslade, residential 1.2
167	Western Harbour Arm Flats 13	325	South Portslade, residential 1.1
168	Western Harbour Arm Flats 14	326	Travis Perkins 1
169	Western Harbour Arm Flats 15	327	Travis Perkins 2
170	Western Harbour Arm Flats 16	328	Travis Perkins 3
171	Western Harbour Arm Flats 17	329	Aldrington Basin Warehouses, Plot 3.1
172	Western Harbour Arm Flats 18	330	Hove Enterprise Centre 1
173	Western Harbour Arm Flats 19	331	Hove Enterprise Centre 2
174	Western Harbour Arm Flats 20	332	Hove Enterprise Centre 3
175	Western Harbour Arm Flats 21	333	Waterside House, Hove Enterprise Centre 4
219	Dudman Aggregate	334	Hove Enterprise Centre 5, Units 1-9
220	Grange Industrial Estate, Coppard plant hire	335	Aldrington Basin Warehouses, Plot 4.1
221	Grange Industrial Estate, Southover Food Company	336	Maritime House
222	Grange Industrial Estate, The Tile Source, Showroom	337	Warehouse East of Maritime House
223	Grange Industrial Estate, Eyre & Elliston, Electrical Distributors	338	Basin Road North, Warehouse 1
224	Grange Industrial Estate, Wemoto, motorcycle parts	339	Beachwood Timber 1
225	Grange Industrial Estate, Optimum Kitchen Appliance Centre	340	Beachwood Timber 2
226	Wyndeham Grange, Printers	341	Aldrington Basin Warehouses, Plot 5.1
227	Wyndeham Grange, Offices	342	Aldrington Basin, PortZED Development
228	Locks Court	343	Blue Lagoon Bar
229	Grange Court	344	Vega
230	Coates Court, building 1	345	Offices behind Vega
231	Coates Court, building 2	346	Aldrington Basin Warehouses, Plot 2.1
232	Coates Court, building 3	347	Aldrington Basin Warehouses, Plot 2.2
233	Watling Court, building 2	348	B & N Fish Sales 2
234	Watling Court, building 1	349	B & N Fish Sales 1
235	Spring Gardens	350	Quayside House
236	Rock Close, building 2	351	Basin Road South, Offices 1
237	Rock Close, building 1	352	Basin Road South, Offices 2
238	Channel View		

Heat Demand Categories
Figure 15 categorises the nature and ownership of key heat loads within the network based on the total heat demand. 34% of the potential heat demand is owned by the private sector and 47% from planned developments. The majority of heat demand (37%) arises from private residential building uses.

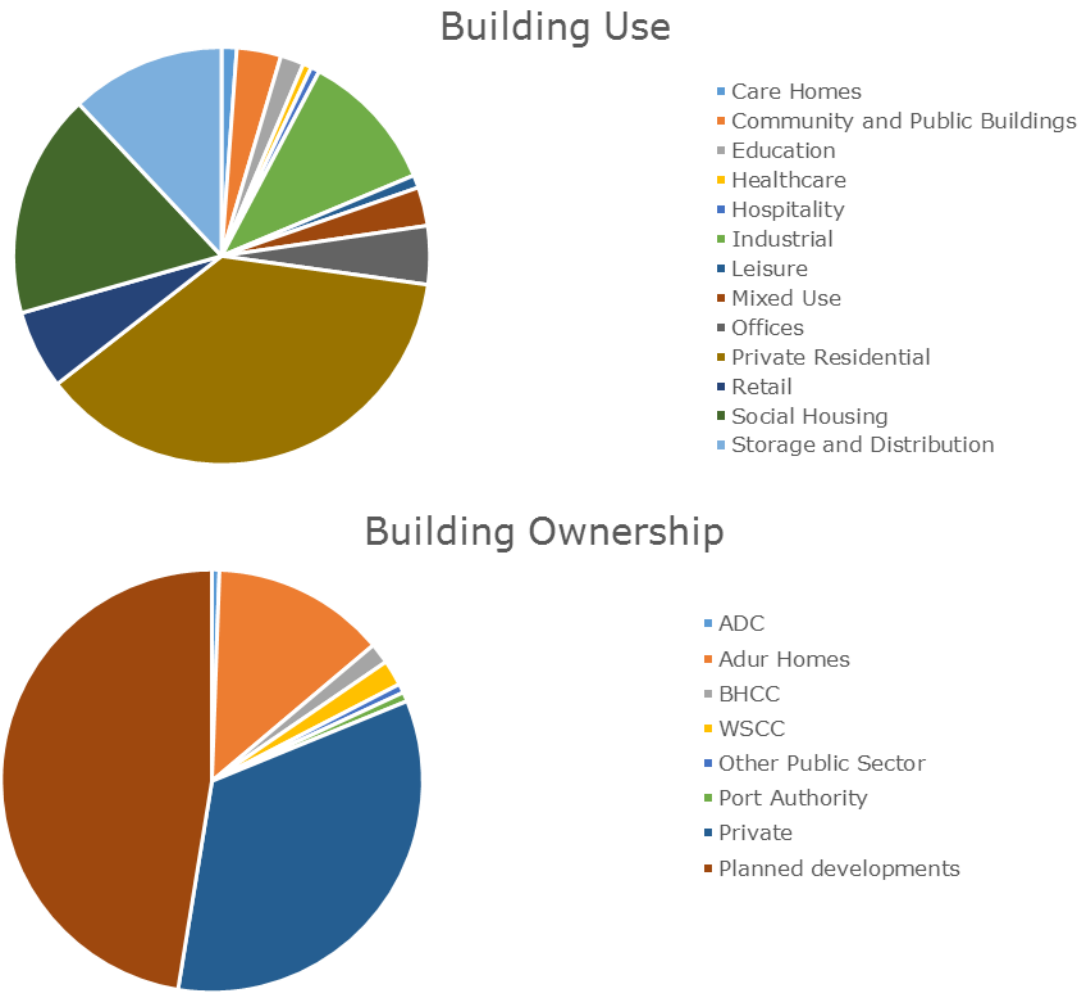


Figure 15: Scenario A phase 1 building use and ownership heat demand categories

Hourly Demand Profile
The hourly heat demand profiles for each of the buildings on the network were combined to create a total annual profile for the phase. The heat losses for the network were calculated as 6,845 MW and added onto the total heat demand profile.

Figure 16 shows the average daily, maximum and minimum hourly heat demand profile for phase 1 of the network. This profile was analysed to provide an understanding of the heat load for technology sizing and was used in the hourly simulation of heat demand and supply to the network. The peak heat demand can be seen as approximately 22 MW occurring at 8.00am. Daily profiles for a winter and summer month are shown in Appendix 4 – Heat Demand Modelling.

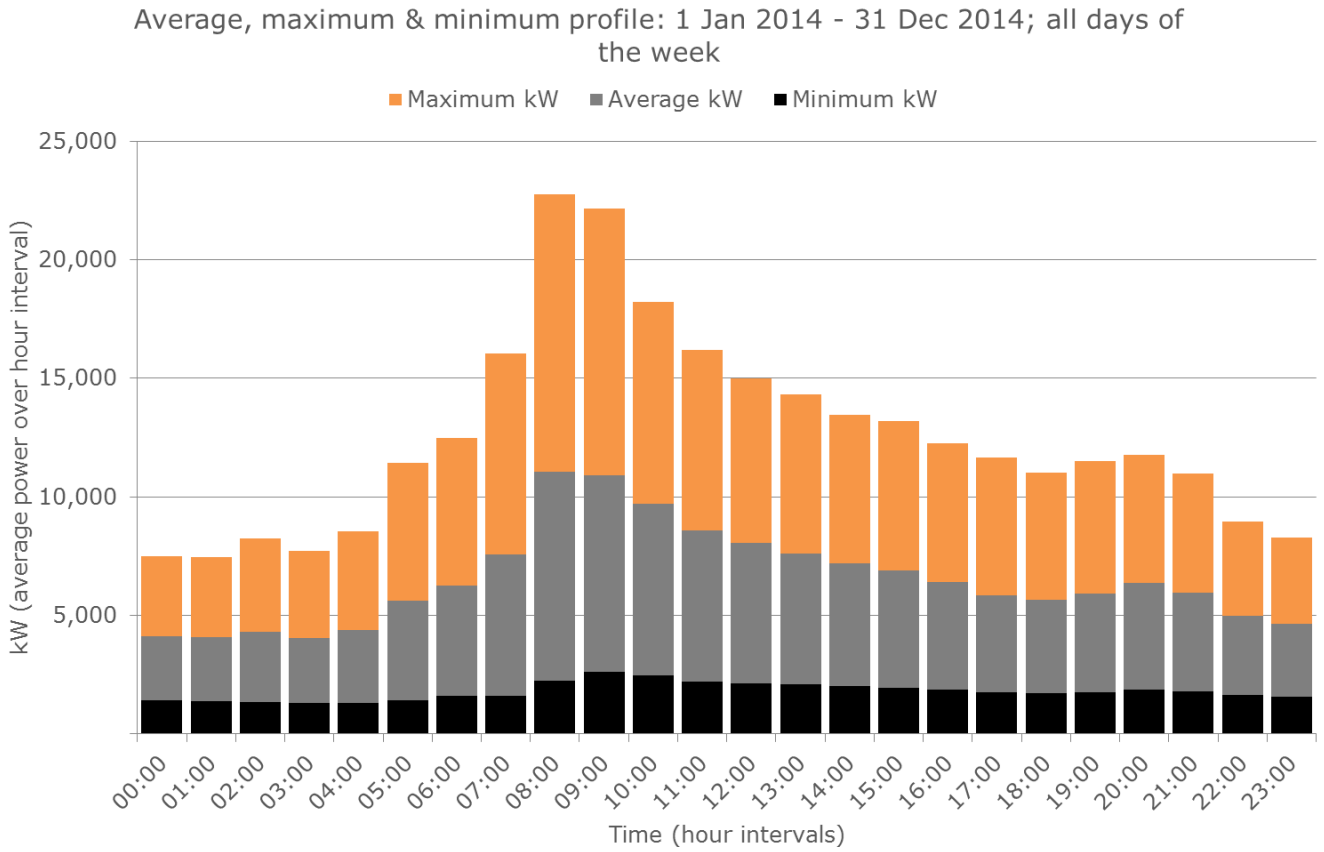


Figure 16: Scenario A phase 1 average daily heat demand

Technology Appraisal

In-house modelling software was used to develop financial cases to compare the feasibility of potential heat source technologies. The financial inputs used in the models are shown in section 4.1. The model calculates all costs and incomes on an hourly basis for a full year; the calculated financials are then linked to a nominal inflationary value of 2.5% and discount factor of 3.5% to determine the 25 year and 40 year high level financial cases. The results of the technology appraisal for phase 1 are shown in Table 8.

Table 8: Scenario A phase 1 technology appraisal

Financial case period		**25 years**	**40 years**
Heat offtake from Edgeley Green		25 MW	
% heat supplied by Edgeley Green		95%	
% heat supplied by peak and reserve		5%	
Capital expenditure	**Technology costs**	£2,047,500	
	Network costs[28]	£16,242,322	
	Total	£18,289,822	
IRR		7%	8%
Net present value		£8,271,631	£20,386,849
Payback		13 years	14 years
Total income		£42,099,368	£81,003,395
Annual carbon savings		11,131 tonnes	

If the majority of potential heat demands connect to the network then, under the assumptions stated in Table 5, there may be a marginal but potentially viable financial case for the phase 1 network.

[28] Includes pipe, trench, design and project management costs as well as costs of connecting existing buildings.

Energy Centre
The peak and reserve energy centre for this network phase will require a land area of 800m^2. This land area does not consider significant further expansion of the network, and if an energy centre was to be large enough to serve phase 3 (by 2035) then it will require a land area of 1,800m^2. As this is a significant land requirement there may be more than one location for peak and reserve plant.

An energy centre could be potentially located on WSCC owned land such as a lorry park near the Southwick Waterfront and the recycling centre near the Western Harbour Arm. Data received from Southern Gas Networks confirms that there is a 500mm existing gas main running along Brighton Road. This is likely to have sufficient capacity to support peak and reserve plant.

The operation of the peak and reserve plant may be the responsibility of EGPS, as the main provider of heat (HeatCo), or maybe contracted to a third party.

Operating Temperatures
Operating temperatures are a key aspect of network design and will impact the capital cost of the network, heat losses and pumping energy[29]. Temperatures should be considered in further detail during feasibility and design but practical and achievable temperatures for the Scenario A network options are as follows:

- Distribution flow temperatures from will be up to a 95^{o}C maximum for peak demand periods with target flow temperatures of as low as 65^{o}C in lower heat demand periods (where most heat is required for domestic hot water and some low levels of space heating).
- Return temperatures may be optimised to 55^{o}C, however, depending on the extent of modifications to existing secondary systems with the buildings this may be limited to around 60^{o}C.

The majority of the existing building heating systems operate with flow temperatures of circa 80^{o}C. Adopting further optimisation will provide an opportunity to reduce flow temperatures to 70^{o}C and return temperatures to approaching 40^{o}C.

Futureproofing measures have been considered to allow for phased future developments and operating conditions assume that the developments are 'district heating ready'; target distribution flow temperatures will be 70^{o}C and return temperatures may be optimised to 40^{o}C.

Thermal Storage
The incorporation of thermal storage (heat accumulation tanks), has a number of benefits for the scenario A networks including:
- Minimising peak load demand during the significant morning peaks
- Reducing peak network capacity and potentially reducing pipe diameters by utilising local distributed stores
- Allowing short interruption in heat supply for minor repairs etc to EGPS.

To achieve benefit of thermal storage over longer periods the volume of required liquid storage will potentially be very large (>1 million litres) and will have implications for land requirements, visual impact and planning. It is likely that a large heat accumulation tank would be beneficial if located close to EGPS and the use, size and location of thermal storage should be further considered at the feasibility stage, when developing the concept design.

Timescale
This phase is reliant upon the construction of EGPS which is due to commence early 2016. The network also includes a modelled 'stage 1' of the JAAP strategic sites including the Western Harbour Arm, South Portslade and Aldrington Basin and the development of the former Adur Civic Centre and car park which will potentially be built by 2020. If this phase goes ahead, effective early engagement with the developers is essential. The approach to engaging with developers and using the planning system is discussed in Chapter 5.

[29] CIBSE / ADE Heat Networks: Code of Practice for the UK

Key Network Risks and Considerations
This network option warrants further investigation and high level financial cases sensitivity and risk will be further assessed using the techno-economic model. The main network risks include the development of EGPS, connection risk, accessing the tunnel to take heat beneath the canal, the potential transport disruption caused by developing the network, crossing the railway line and locating the energy centre in a space confined area.

Crossing the railway line will require detailed investigation at the feasibility stage. The scenario A phase 1 network currently crosses the railway line at three points; once at a level crossing and twice via an underpass (where the road runs beneath the railway line). This increases risk of connecting to the north of the railway line as gaining permission from Network Rail to install the pipes at the level crossing may prove to be a lengthy process.

As 34% of potential heat demand comes from the private sector (mainly residential) and 47% from planned developments, connection risk will be high.

3.2.2 Scenario A, Phase 2

The Network

The phase 2 network is shown in Figure 17 and a summary of the network is provided in Table 9.

Table 9: Scenario A, Phase 2 network summary

No. heat loads	Trench length	Total heat demand	Peak heat demand	Heat losses	Key heat loads	Date
274	19.5km	92,405 MWh	36 MW	12%	- King Alfred Leisure Centre planned development - Western Harbour Arm Flats 2, 9 & 10 planned developments - Adur Civic Centre redevelopment - Shoreham Academy - Steven's Court social housing - Southlands residential development - Southlands Hospital	2020

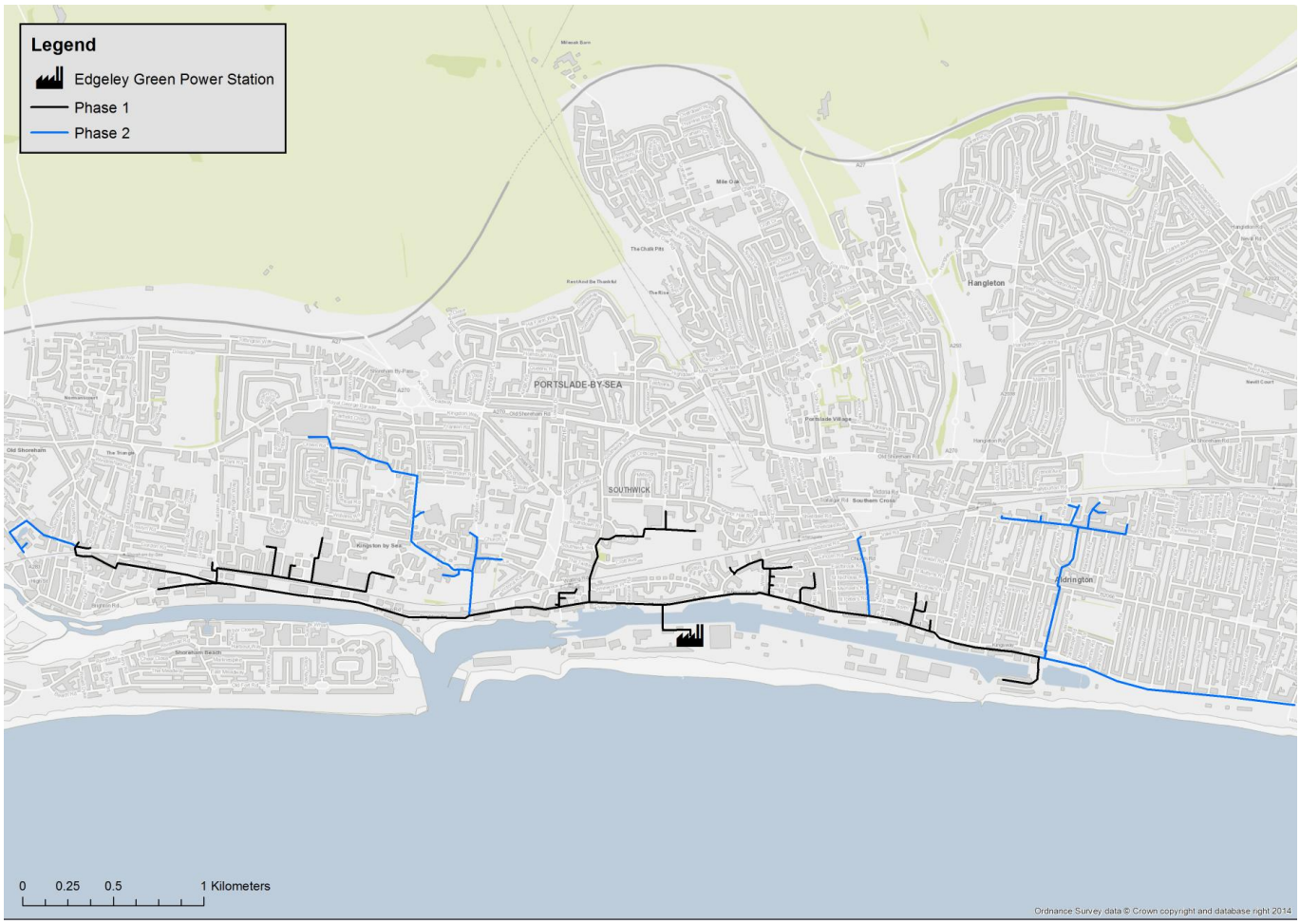


Figure 17: Scenario A phase 2 pipe route and Edgeley Green Power Station location

Figure 18, Figure 19 and Figure 20 show the phase 2 potential key heat load location, ownership, heat demands and pipe route. Table 10 lists the heat demands numbered in the aforementioned figures.

Figure 18: Eastern section of scenario A phase 2

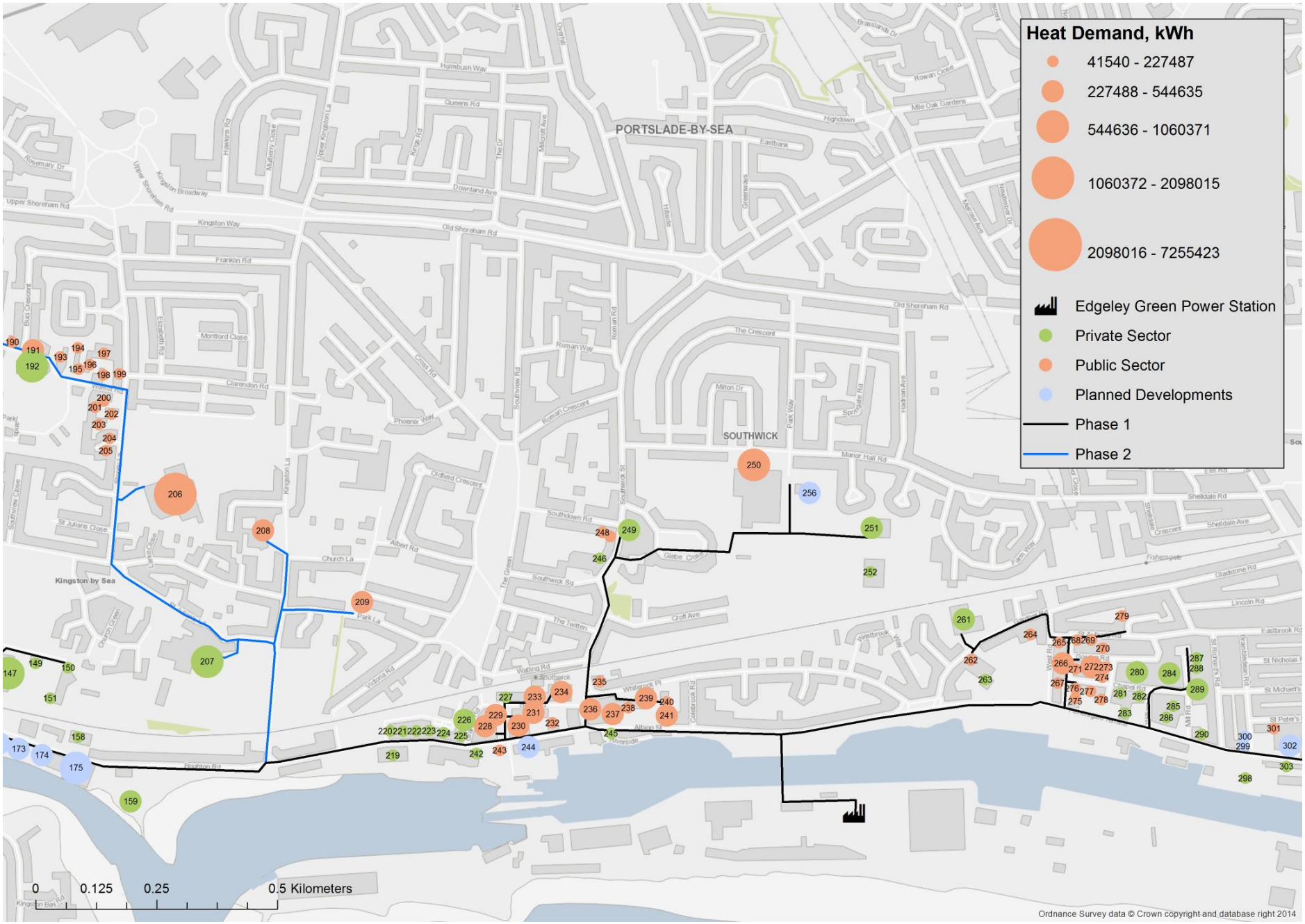


Figure 19: Central section of scenario A phase 2

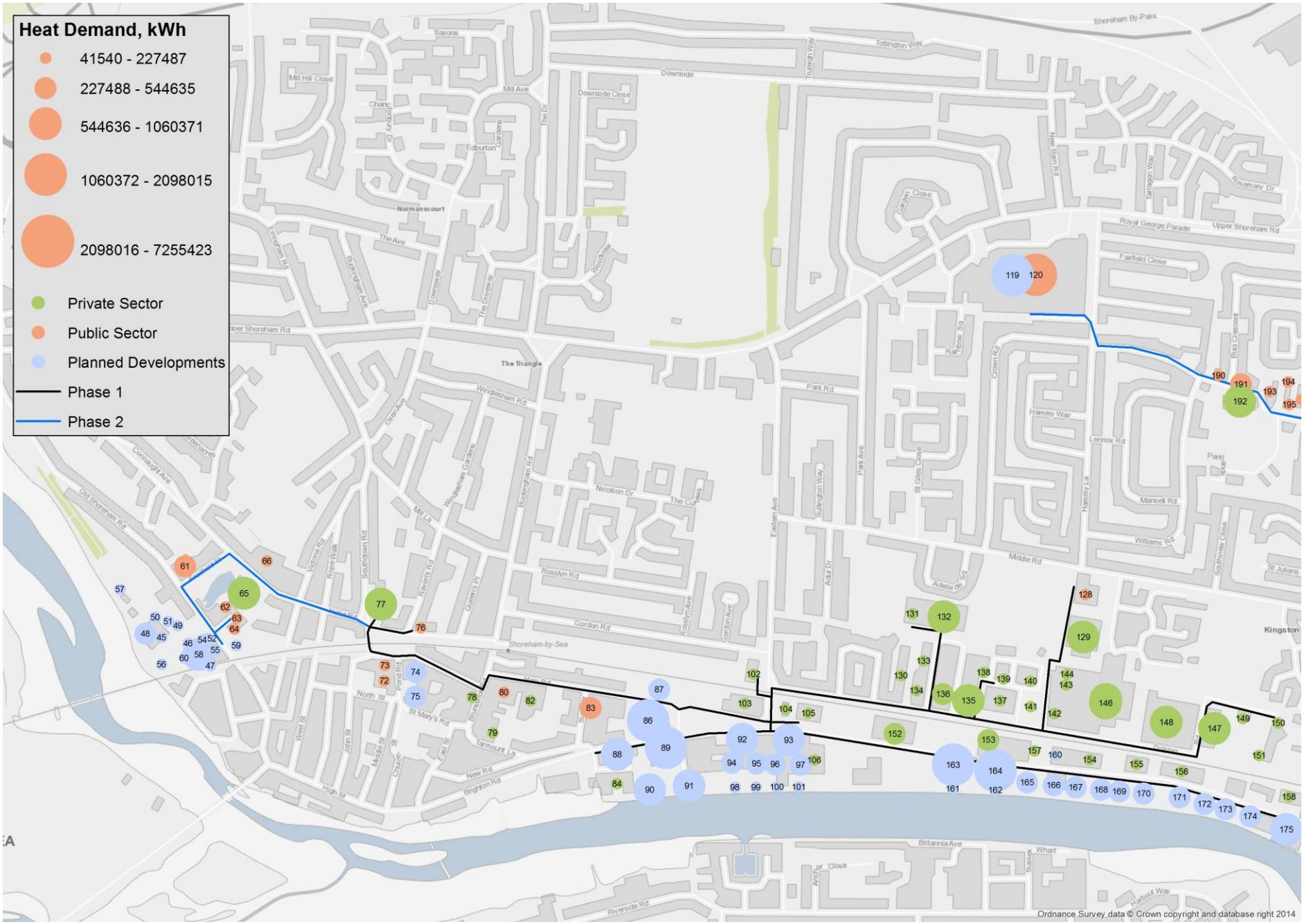


Figure 20: Western section of scenario A phase 2

Table 10: Building identifications for scenario A phase 2

Site ID	Building Name	Site ID	Building Name
45	Ropetackle North, 12x House Type 3	231	Coates Court, building 2
46	Ropetackle North, 14x House Type 2	232	Coates Court, building 3
47	Ropetackle North, 18x railway arches	233	Watling Court, building 2
48	Ropetackle North, 23x House Type 1	234	Watling Court, building 1
49	Ropetackle North, 2x Mews House Type 1	235	Spring Gardens
50	Ropetackle North, 3x House Type 4	236	Rock Close, building 2
51	Ropetackle North, 5x Mews House Type 2	237	Rock Close, building 1
52	Ropetackle North, Block A1	238	Channel View
53	Ropetackle North, Block A2	239	Sea House
54	Ropetackle North, Block A3	240	Harbour Court
55	Ropetackle North, Block B1	241	Albion House
56	Ropetackle North, Block C	242	Dudman Offices
57	Ropetackle North, Block D	243	Nautilus House, Port Authority Offices
58	Ropetackle North, Block E	244	Southwick Waterfront, Lady Bee Marina
59	Ropetackle North, Block F	245	Old Town Hall
60	Ropetackle North, Block G	246	PB Law solicitors
61	Aston House	247	Doctors Surgery, Manor Practise
62	Buckingham Street, building 1	248	Southwick Library
63	Buckingham Street, building 2	249	Southwick Community Association
64	Buckingham Street, building 3	250	Eastbrook Primary Academy (North site)
65	Homehaven Court	251	Leisure Centre
66	Swiss Gardens Primary School	252	Indoor Bowling Club
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87	Adur Civic Centre Car Park	273	Laylands Court, building 3
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89	Western Harbour Arm Flats 2	275	Old Mill Close, building 1
90	Western Harbour Arm Flats 3	276	Old Mill Close, building 2
91	Western Harbour Arm Flats 4	277	Old Mill Close, building 3
92	Western Harbour Arm Flats 5	278	Old Mill Close, building 4
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96	Western Harbour Arm Housing 3	282	Greg Stone, flooring
97	Western Harbour Arm Housing 4	283	R&D Goatley Ltd
98	Western Harbour Arm Employment 1	284	Kew Electrical
99	Western Harbour Arm Employment 2	285	Chapel Road, Warehouse units
100	Western Harbour Arm Employment 3	286	Johnsons Apparel Master
101	Western Harbour Arm Employment 4	287	Mill Road Industrial Estate
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104	McDonalds, Eastern Avenue	290	The Adenstar Group offices
105	Halfords	298	Cemex
106	Paladone	299	South Portslade, residential 5.1
119	Southlands Hospital Development	300	South Portslade, residential houses next to 5.1
120	Southlands Hospital	301	St Peter's Community Primary School

Site ID	Building Name	Site ID	Building Name
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129	Kingsland House Care Home	303	CP Mechanical Designs Limited
130	Warehouse, 13 Dolphin Road	304	South Portslade Industrial Redevelopment, A
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132	To let, previously PaperLinx	306	London & Brighton Plating
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139	Dolphin Enterprise Centre, C, 8 units	313	Unknown Offices, North Street
140	Dolphin Enterprise Centre, B, 8 units	314	Display House
141	Edgars, Dolphin Enterprise Centre, A, 4 units	315	City Coast Church
142	DAF	316	Offices, East Street
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144	Hall Business Centre	318	Warehouse, East Street
145	Infinity Foods Coop	319	Offices, North Street
146	VW Heritage	320	South Portslade Industrial Redevelopment, C 1
147	Higgidy	321	South Portslade Industrial Redevelopment, C 2
148	Pyroban	322	South Portslade, residential 3.1
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153	The Cyril Richings Business Centre, 4 units	327	Travis Perkins 2
154	Screw fix	328	Travis Perkins 3
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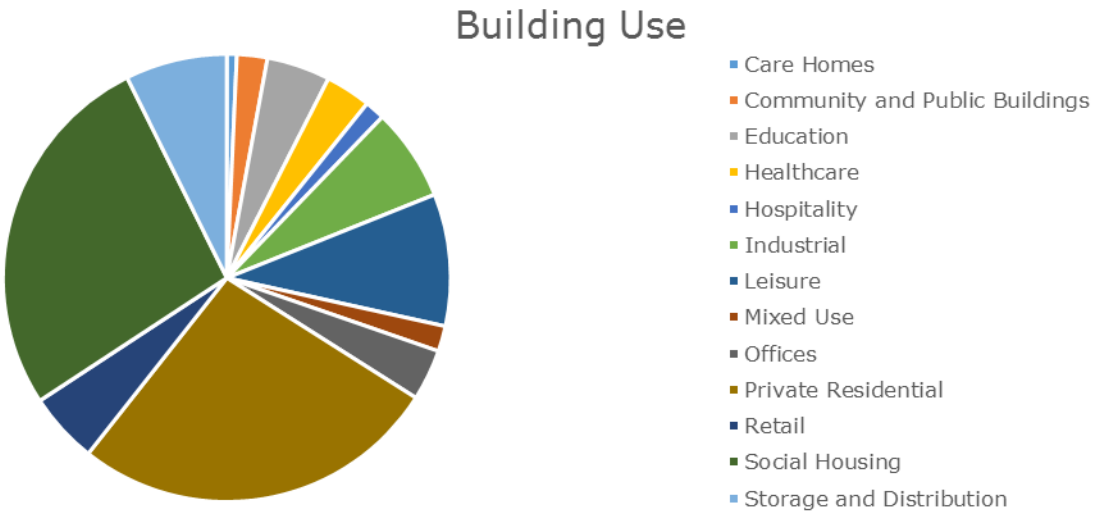
156	Travis Perkins Timber & Building Supplies	330	Hove Enterprise Centre 1
157	City Plumbing Supplies	331	Hove Enterprise Centre 2
158	To let, warehouse opposite Howard Kent	332	Hove Enterprise Centre 3
159	RNLI Lifeboat station	333	Waterside House, Hove Enterprise Centre 4
160	Lidl Development	334	Hove Enterprise Centre 5, Units 1-9
161	Western Harbour Arm Employment 9	335	Aldrington Basin Warehouses, Plot 4.1
162	Western Harbour Arm Employment 10	336	Maritime House
163	Western Harbour Arm Flats 9	337	Warehouse East of Maritime House
164	Western Harbour Arm Flats 10	338	Basin Road North, Warehouse 1
165	Western Harbour Arm Flats 11	339	Beachwood Timber 1
166	Western Harbour Arm Flats 12	340	Beachwood Timber 2
167	Western Harbour Arm Flats 13	341	Aldrington Basin Warehouses, Plot 5.1
168	Western Harbour Arm Flats 14	342	Aldrington Basin, PortZED Development
169	Western Harbour Arm Flats 15	343	Blue Lagoon Bar
170	Western Harbour Arm Flats 16	344	Vega
171	Western Harbour Arm Flats 17	345	Offices behind Vega
172	Western Harbour Arm Flats 18	346	Aldrington Basin Warehouses, Plot 2.1
173	Western Harbour Arm Flats 19	347	Aldrington Basin Warehouses, Plot 2.2
174	Western Harbour Arm Flats 20	348	B & N Fish Sales 2
175	Western Harbour Arm Flats 21	349	B & N Fish Sales 1
190	Loney Court	350	Quayside House
191	Fraser Court	351	Basin Road South, Offices 1
192	Milward Court	352	Basin Road South, Offices 2
193	Penstone Court	353	Tozer Court
194	Julian Court	354	Vale Court

Site ID	Building Name	Site ID	Building Name
195	Wilmot Court	355	St Mary's Catholic Primary School
196	Osborne Court	356	Portslade Health Centre
197	Holmbush Court	357	Portslade Community Centre
198	Downes Court	374	EDF Offices 1
199	Adur Court	375	EDF Offices 2
200	Broadway Court	376	EDF Offices 3
201	Wiston Court	377	EDF Offices 4
202	Arun Court	378	EDF Offices 5
203	Arundel Court	379	Martello House, residential development
204	Caius Court	380	Portland Road Trading Estate
205	Kingston Court	381	Portland Business Park Building 1
206	Shoreham Academy	382	Portland Business Park Building 2
207	Shoreham College	383	Portland Business Park Building 3
208	Ashcroft Sheltered Housing	384	Wish Court, flats 1-23
209	Marsh House	385	Wish Court, flats 24-32
219	Dudman Aggregate	386	Muriel House
220	Grange Industrial Estate, Coppard plant hire	387	Sanders House
221	Grange Industrial Estate, Southover Food Company	388	Jordan Court
222	Grange Industrial Estate, The Tile Source, Showroom	389	Knoll House
223	Grange Industrial Estate, Eyre & Elliston, Electrical Distributors	390	Stevens Court
224	Grange Industrial Estate, Wemoto, motorcycle parts	391	Benson Court
225	Grange Industrial Estate, Optimum Kitchen Appliance Centre	392	Mountbatten Court
226	Wyndeham Grange, Printers	393	Lovegrove Court, flats 1-28
227	Wyndeham Grange, Offices	394	Lovegrove Court, flats 29-54
228	Locks Court	395	Ingram Court
229	Grange Court	396	Ingram Court, flats 1-38
230	Coates Court, building 1	397	King Alfred Development

Heat Demand Categories

Figure 21 categorises the nature and ownership of key heat loads within the network based on the total heat demand. 27% of the heat demand comes from the private sector and 43% from planned developments. The majority of heat demand arises from private residential and social housing both accounting for 27% of the heat demand each.



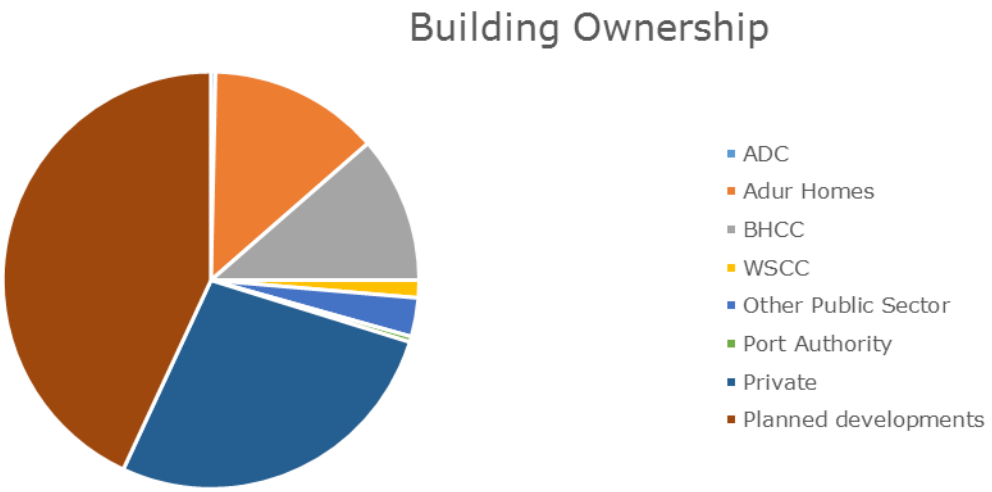


Figure 21: Scenario A phase 2 building use and ownership heat demand categories

Hourly Heat Demand Profile

The heat losses for phase 2 of the network were calculated as 10,767 MW and added onto the total heat demand profile. These losses equate to 12% of the total network demand. The hourly heat demand profile showing the average, maximum and minimum heat demands for the network is shown in Figure 22. The peak heat demand is approximately 35 MW occurring at 8.00am. Daily profiles for a winter and summer month are shown in Appendix 4 – Heat Demand Modelling.

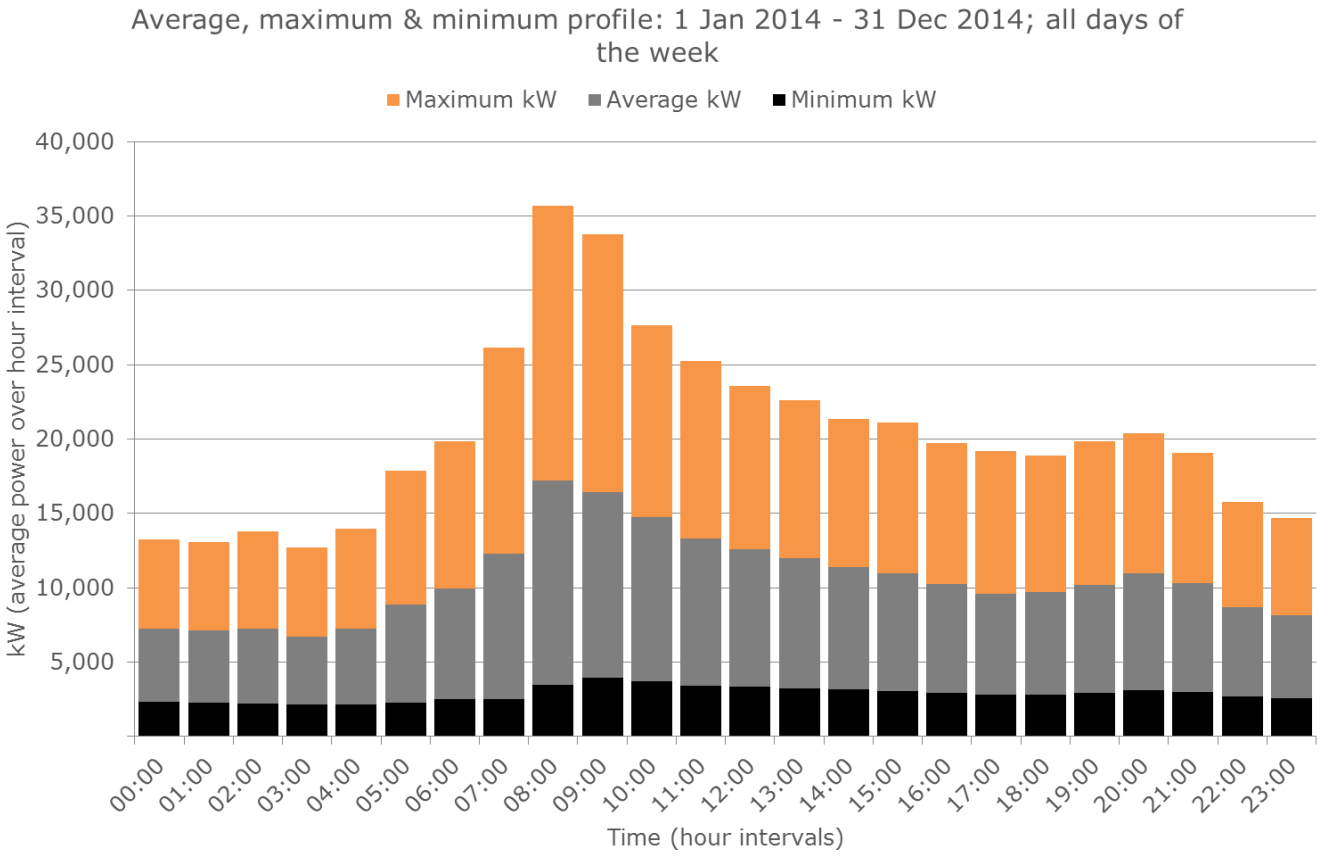


Figure 22: Scenario A phase 2 average daily heat demand

Technology Appraisal

The results from the technology appraisal for the phase 2 network are shown in Table 11. The financial inputs used in the models are shown in section 4.1.

Table 11: Scenario A phase 2 technology appraisal

Financial case period		25 years	40 years
Heat offtake from EGPS		25 MW	
% heat supplied by Edgeley Green		94%	
% heat supplied by peak and reserve		6%	
Capital expenditure	**Technology costs**	£3,192,000	
	Network costs	£25,159,373	
	Total costs	£28,351,373	
IRR		7%	9%
Net present value		£15,197,019	£35,139,949
Payback		13 years	13 years
Total income		£69,023,323	£132,974,545
Carbon savings		18,040 tonnes	

If the majority of potential heat demands connect to the network then, under the assumptions used in Table 5, there may be a marginal but potentially viable financial case for the phase 2 network.

Energy Centre
The peak and reserve energy centre or energy centres would require a land area of 1,200m^2, an additional requirement of 400m^2 on the phase 1. The location or locations of the boilers will be dictated by available space and land ownership (as outlined in 3.2.1).

Timescale
This phase expands the phase 1 network connecting to additional existing heat loads and includes the Ropetackle North and Southlands planned developments. If developments go ahead as planned then this phase could also be implemented by 2020. Planning permission for Ropetackle North was granted on the 12/06/2015 with construction due to commence in 2016. Planning permission for the Southlands planned development was granted on the 10/02/2015 and a reserved matters application submitted on the 07/08/2015.

Key Network Risks and Considerations
This network option warrants further investigation and high level financial cases sensitivity and risk will be assessed using the techno-economic model. The main network risks include connection risk, crossing the railway line, potential transport disruption caused by developing the network and locating the energy centre in a space confined area.

27% of the heat demand comes from the private sector (mainly residential) and 43% from planned development and so connection risk will be high. Effective early engagement with the Ropetackle North and Southlands developers is essential.

3.2.3 Scenario A, Phase 3

The Network

The phase 3 network is shown in Figure 23 and a summary of the network is provided in Table 12. The network expands phase 2 to include Shoreham Airport, Ricardo Technical Centre and Shoreham Airport planned development to the west, Rosslyn Court, Buckingham Park Primary School and the Holmbush Shopping centre to the north and existing buildings along Manor Road and Victoria Road to the east. The network route crosses the River Adur to the North via Shoreham Tollbridge and to the South via the A259 road bridge.

Table 12: Scenario A, Phase 3 network summary

No. heat loads	Trench length	Total heat demand	Peak heat demand	Heat losses	Key heat loads	Date
384	29km	133,143 MWh	52 MW	12%	- King Alfred Leisure Centre planned development - Western Harbour Arm Flats 2, 9 & 10 planned developments - Adur Civic Centre redevelopment - Shoreham Academy - Steven's Court social housing - Southlands residential development - Southlands Hospital - 79-81 Brighton Road	2035

Figure 23: Scenario A phase 3 pipe route and Edgeley Green Power Station location

Figure 24, Figure 25, Figure 26 and Figure 27 show the phase 3 potential key heat load locations, ownership, heat demands and pipe route. Table 13 lists the heat demands numbered in the figures.

Figure 24: Eastern section of scenario A phase 3

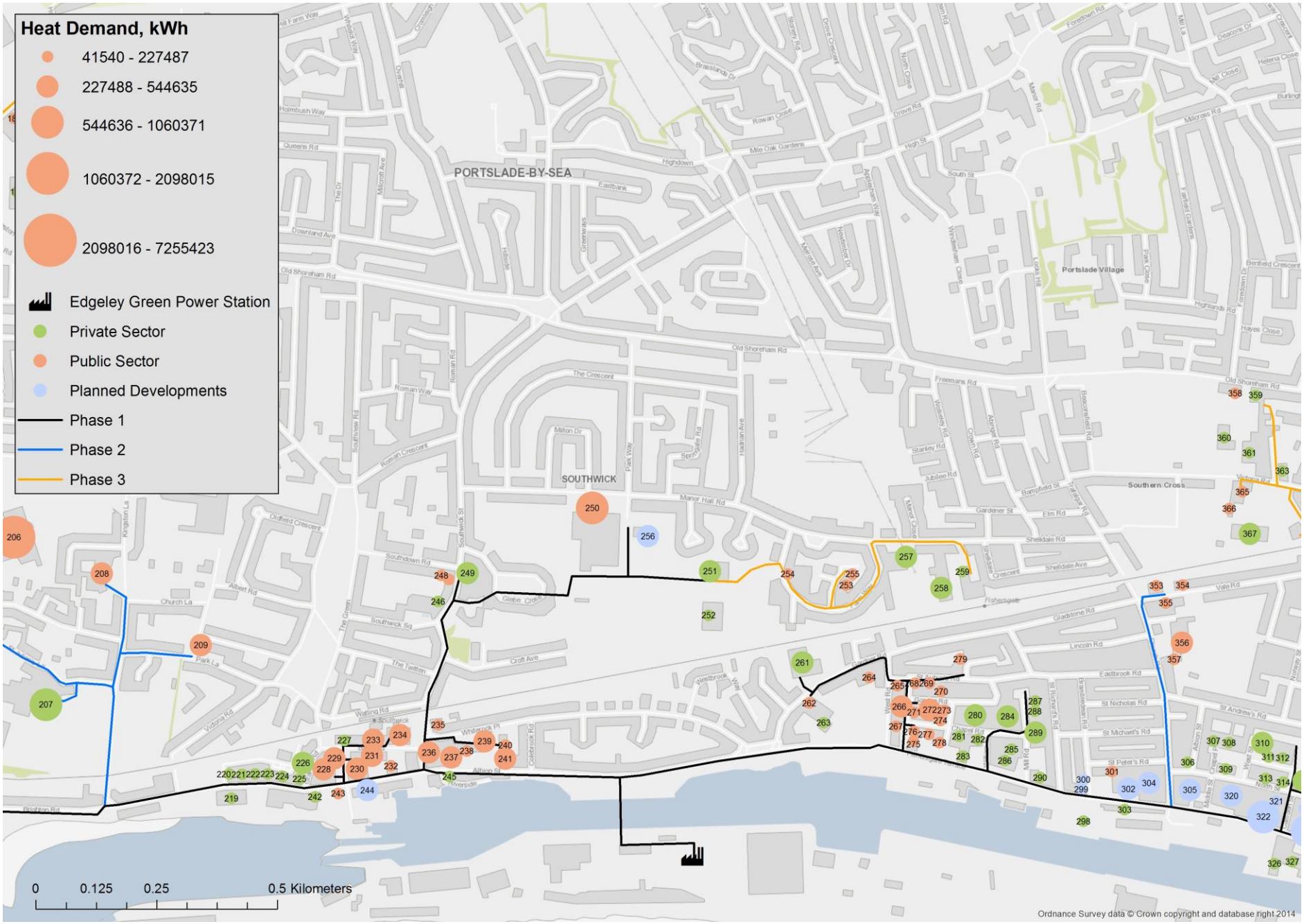


Figure 25: Central section of scenario A phase 3

Figure 26: West of central section of scenario A phase 3

Figure 27: Far western section of scenario A phase 3

Table 13: Building identifications for scenario A phase 3

Site ID	Building Name	Site ID	Building Name
1	Ricardo Industrial Building 1	222	Grange Industrial Estate, The Tile Source, Showroom
2	Ricardo Industrial Building 2	223	Grange Industrial Estate, Eyre & Elliston, Electrical Distributors
3	Ricardo Industrial Building 3	224	Grange Industrial Estate, Wemoto, motorcycle parts
4	Ricardo Industrial Building 4	225	Grange Industrial Estate, Optimum Kitchen Appliance Centre
5	Ricardo Industrial Building 5	226	Wyndeham Grange, Printers
6	Ricardo Industrial Building 6	227	Wyndeham Grange, Offices
7	Ricardo Industrial Building 7	228	Locks Court
8	Ricardo Industrial Building 8	229	Grange Court
9	Ricardo Offices 1	230	Coates Court, building 1
10	Ricardo Offices 2	231	Coates Court, building 2
11	Ricardo Offices 3	232	Coates Court, building 3
12	Ricardo Offices 4	233	Watling Court, building 2
13	Ricardo Offices 5	234	Watling Court, building 1
14	Ricardo Offices 6	235	Spring Gardens
15	Shoreham Airport Development	236	Rock Close, building 2
16	Hanger 1	237	Rock Close, building 1
17	Transair Pilot Shop	238	Channel View
18	Hanger 2	239	Sea House
19	Perry Air	240	Harbour Court
20	Hanger 3	241	Albion House
21	Hanger 4	242	Dudman Offices
22	Shoreham Airport, Unknown Units 1	243	Nautilus House, Port Authority Offices
23	Shoreham Airport, Unknown Units 2	244	Southwick Waterfront, Lady Bee Marina
24	Shoreham Airport, Unknown Units 3	245	Old Town Hall
25	Shoreham Airport, Unknown Units 4	246	PB Law solicitors
26	Shoreham Airport, Unknown Units 5	247	Doctors Surgery, Manor Practise
27	Shoreham Airport, Unknown Units 6	248	Southwick Library
28	Shoreham Airport, Unknown Units 7	249	Southwick Community Association
29	Shoreham Airport, Unknown Units 8	250	Eastbrook Primary Academy (North site)
30	Shoreham Airport Terminal Building	251	Leisure Centre
31	Shoreham Airport Building	252	Indoor Bowling Club
32	Shoreham Airport, Unknown Units 9	253	Lewis Court
33	Northbrook College Sussex	254	Manor Court
34	Highdown House	255	Barn Court
35	Shoreham Airport, Unknown Units 10	256	Land Adjacent to Eastbrook Academy
36	FTA	257	John Nicholas Furniture
37	Shoreham Airport, Unknown Units 11	258	Alloy & Steel Metalworks Ltd
38	Shoreham Airport, Unknown Units 12	259	Chalex Industrial Estate (Car repair workshops)
39	Shoreham Airport, Unknown Units 13	261	Nyenex House
40	Hanger 5	262	Stepping Stones Children Family Centre, Council Health Centre
41	Gear4DJs	263	Community Centre Fishergate
42	Shoreham Airport, Unknown Units 14	264	Eastbrook Primary Academy (South Site)
43	Grazing land southwest of flyover	265	Westlands Court, building 1
44	Tollbridge House	266	Westlands Court, building 2
45	Ropetackle North, 12x House Type 3	267	Westlands Court, building 3
46	Ropetackle North, 14x House Type 2	268	5-8 Laylands road
47	Ropetackle North, 18x railway arches	269	Wyck Court, building 1
48	Ropetackle North, 23x House Type 1	270	Wyck Court, building 2
49	Ropetackle North, 2x Mews House Type 1	271	Laylands Court, building 1
50	Ropetackle North, 3x House Type 4	272	Laylands Court, building 2
51	Ropetackle North, 5x Mews House Type 2	273	Laylands Court, building 3
52	Ropetackle North, Block A1	274	Laylands Court, building 4
53	Ropetackle North, Block A2	275	Old Mill Close, building 1
54	Ropetackle North, Block A3	276	Old Mill Close, building 2

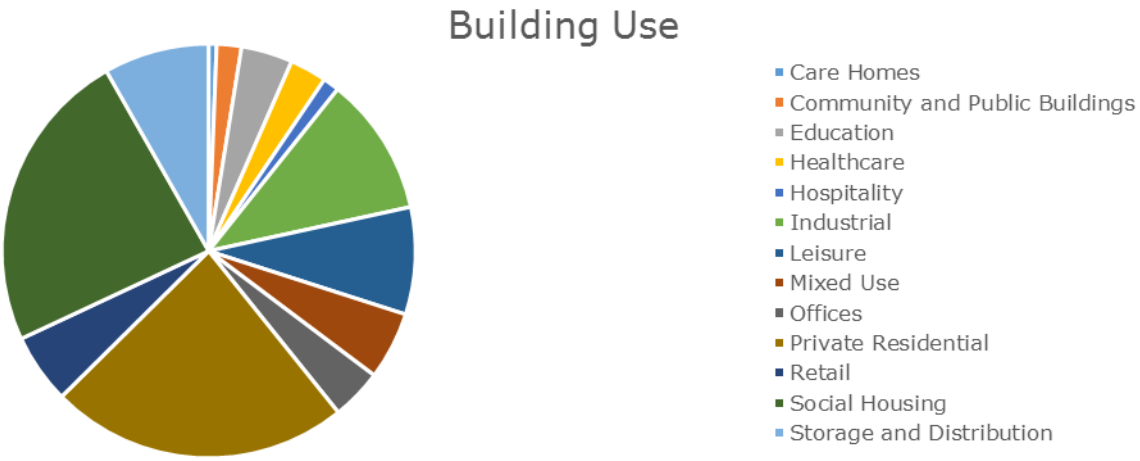
Site ID	Building Name	Site ID	Building Name
55	Ropetackle North, Block B1	277	Old Mill Close, building 3
56	Ropetackle North, Block C	278	Old Mill Close, building 4
57	Ropetackle North, Block D	279	Summer Close
58	Ropetackle North, Block E	280	Big Box Self Storage
59	Ropetackle North, Block F	281	Tungsten Buildings, 12 units
60	Ropetackle North, Block G	282	Greg Stone, flooring
61	Aston House	283	R&D Goatley Ltd
62	Buckingham Street, building 1	284	Kew Electrical
63	Buckingham Street, building 2	285	Chapel Road, Warehouse units
64	Buckingham Street, building 3	286	Johnsons Apparel Master
65	Homehaven Court	287	Mill Road Industrial Estate
66	Swiss Gardens Primary School	288	Adams Packaging
67	Ropetackle Arts and Business Centre	289	Southdown Construction Ltd, Fishergate Forge
68	West Court	290	The Adenstar Group offices
69	White Lion Court	298	Cemex
70	The Original Factory Shop	299	South Portslade, residential 5.1
71	Coop, High Street	300	South Portslade, residential houses next to 5.1
72	Shoreham Centre, Community Centre	301	St Peter's Community Primary School
73	Shoreham Centre, Council Offices	302	South Portslade, residential 4.1
74	Pond Road, Community Building	303	CP Mechanical Designs Limited
75	Pond Road, Residential	304	South Portslade Industrial Redevelopment, A
76	Cecil Norris House	305	South Portslade Industrial Redevelopment, B
77	St Paul's Lodge	306	London & Brighton Plating
78	Royal Mail Delivery Office	307	Jewson
79	Tarmount Lane, telephone exchange	308	Jewsons Warehouse
80	Police Station	309	Offices, 2 North Street
82	Coop, Ham Road	310	Eurovans Brighton
83	Pashley Court	311	D W Electrical
84	Riverside Business Centre, 12 units	312	Iveco
85	79-81 Brighton Road, Parcelforce site	313	Unknown Offices, North Street
86	Adur Civic Centre	314	Display House
87	Adur Civic Centre Car Park	315	City Coast Church
88	Western Harbour Arm Flats 1	316	Offices, East Street
89	Western Harbour Arm Flats 2	317	South Portslade, residential 2.1
90	Western Harbour Arm Flats 3	318	Warehouse, East Street
91	Western Harbour Arm Flats 4	319	Offices, North Street
92	Western Harbour Arm Flats 5	320	South Portslade Industrial Redevelopment, C 1
93	Western Harbour Arm Flats 6	321	South Portslade Industrial Redevelopment, C 2
94	Western Harbour Arm Housing 1	322	South Portslade, residential 3.1
95	Western Harbour Arm Housing 2	323	South Portslade Industrial Redevelopment, D
96	Western Harbour Arm Housing 3	324	South Portslade, residential 1.2
97	Western Harbour Arm Housing 4	325	South Portslade, residential 1.1
98	Western Harbour Arm Employment 1	326	Travis Perkins 1
99	Western Harbour Arm Employment 2	327	Travis Perkins 2
100	Western Harbour Arm Employment 3	328	Travis Perkins 3
101	Western Harbour Arm Employment 4	329	Aldrington Basin Warehouses, Plot 3.1
102	Palace Drinks	330	Hove Enterprise Centre 1
107	Rosslyn Court, building 1	331	Hove Enterprise Centre 2
108	Rosslyn Court, building 2	332	Hove Enterprise Centre 3
109	Rosslyn Court, building 3	333	Waterside House, Hove Enterprise Centre 4
110	Buckingham Park Primary School	334	Hove Enterprise Centre 5, Units 1-9
111	Fairlawns, building 1	335	Aldrington Basin Warehouses, Plot 4.1
112	Fairlawns, building 2	336	Maritime House
113	Fairlawns, building 3	337	Warehouse East of Maritime House

Site ID	Building Name	Site ID	Building Name
114	Fairlawns, building 4	338	Basin Road North, Warehouse 1
115	Fairlawns, building 5	339	Beachwood Timber 1
116	St Nicolas and St Mary Primary School	340	Beachwood Timber 2
117	Northbourne Medical Centre	341	Aldrington Basin Warehouses, Plot 5.1
118	St Peters Roman Catholic Primary School	342	Aldrington Basin, PortZED Development
119	Southlands Hospital Development	343	Blue Lagoon Bar
120	Southlands Hospital	344	Vega
121	Elmcroft Care Home	345	Offices behind Vega
122	Beeding Court	346	Aldrington Basin Warehouses, Plot 2.1
123	Bramber Court	347	Aldrington Basin Warehouses, Plot 2.2
124	Sompting Court	348	B & N Fish Sales 2
125	Southlands Court	349	B & N Fish Sales 1
126	Kingston Buci Children & Family Centre	350	Quayside House
127	Cavell House Care Home	351	Basin Road South, Offices 1
128	Glebelands Day Hospital	352	Basin Road South, Offices 2
129	Kingsland House Care Home	353	Tozer Court
130	Warehouse, 13 Dolphin Road	354	Vale Court
131	Warehouse behind 13 Dolphin Road	355	St Mary's Catholic Primary School
132	To let, previously PaperLinx	356	Portslade Health Centre
133	5 Industrial Units, Dolphin Way	357	Portslade Community Centre
134	House of Hugo	358	Portslade Library & Children's Centre
135	Gemini Press Printers	359	Footsteps Day Nursery
136	Gemini Press Warehouse	360	Caffyns Volkswagen, Car Showroom
137	Dolphin Enterprise Centre, formerly Edwards	361	Dinnages, Car showroom
138	Dolphin Enterprise Centre, D, 4 units	362	Benfield Primary School
139	Dolphin Enterprise Centre, C, 8 units	363	Mini, Car Garage
140	Dolphin Enterprise Centre, B, 8 units	364	Chandlers Cars
141	Edgars, Dolphin Enterprise Centre, A, 4 units	365	Portslade Town Hall
142	DAF	366	Portslade Community Buildings (behind Town Hall)
143	Unknown Warehouse, behind DAF	367	Boulder Brighton, Climbing Centre
144	Hall Business Centre	369	Rivervale Cars
145	Infinity Foods Coop	370	Mercedes-Benz, car showroom
146	VW Heritage	371	Lockers Prestige, car showroom
147	Higgidy	372	Aldi
148	Pyroban	373	Job Centre
149	G3 Business Park, Units 11-12	374	EDF Offices 1
150	G3 Business Park, Units 1-7	375	EDF Offices 2
151	G3 Business Park, Units 8-10	376	EDF Offices 3
159	RNLI Lifeboat station	377	EDF Offices 4
161	Western Harbour Arm Employment 9	378	EDF Offices 5
162	Western Harbour Arm Employment 10	379	Martello House, residential development
163	Western Harbour Arm Flats 9	380	Portland Road Trading Estate
164	Western Harbour Arm Flats 10	381	Portland Business Park Building 1
165	Western Harbour Arm Flats 11	382	Portland Business Park Building 2
166	Western Harbour Arm Flats 12	383	Portland Business Park Building 3
167	Western Harbour Arm Flats 13	384	Wish Court, flats 1-23
168	Western Harbour Arm Flats 14	385	Wish Court, flats 24-32
169	Western Harbour Arm Flats 15	386	Muriel House
170	Western Harbour Arm Flats 16	387	Sanders House
171	Western Harbour Arm Flats 17	388	Jordan Court
172	Western Harbour Arm Flats 18	389	Knoll House
173	Western Harbour Arm Flats 19	390	Stevens Court
174	Western Harbour Arm Flats 20	391	Benson Court
175	Western Harbour Arm Flats 21	392	Mountbatten Court
183	Holmbush Shopping Centre, Tesco	393	Lovegrove Court, flats 1-28
184	Holmbush Shopping Centre, McDonalds	394	Lovegrove Court, flats 29-54
185	Holmbush Shopping Centre, Marks & Spencer	395	Ingram Court
186	Holmbush Primary School	396	Ingram Court, flats 1-38

Site ID	Building Name	Site ID	Building Name
187	Herons Dale Primary School	397	King Alfred Development
188	Next	398	WHA Stage 2 Employment 5
189	Swimming Pool	399	WHA Stage 2 Employment 6
190	Loney Court	400	WHA Stage 2 Employment 7
191	Fraser Court	401	WHA Stage 2 Employment 8
192	Milward Court	402	WHA Stage 2 Flats 7
193	Penstone Court	403	WHA Stage 2 Flats 8
194	Julian Court	404	WHA Stage 2 Housing 5
195	Wilmot Court	405	WHA Stage 2 Housing 6
196	Osborne Court	406	WHA Stage 2 Housing 7
197	Holmbush Court	407	WHA Stage 2 Housing 8
198	Downes Court	408	WHA Stage 3 Flats 1
199	Adur Court	409	WHA Stage 3 Flats 2
200	Broadway Court	410	WHA Stage 3 Flats 3
201	Wiston Court	411	WHA Stage 3 Flats 4
202	Arun Court	412	WHA Stage 3 Flats 5
203	Arundel Court	413	WHA Stage 3 Flats 6
204	Caius Court	414	WHA Stage 3 Flats 7
205	Kingston Court	415	WHA Stage 3 Flats 8
206	Shoreham Academy	416	WHA Stage 3 Flats 9
207	Shoreham College	417	WHA Stage 3 Flats 10
208	Ashcroft Sheltered Housing	418	WHA Stage 3 Flats 11
209	Marsh House	419	WHA Stage 3 Flats 12
219	Dudman Aggregate	420	WHA Stage 3 Flats 13
220	Grange Industrial Estate, Coppard plant hire	421	WHA Stage 3 Flats 14
221	Grange Industrial Estate, Southover Food Company	422	WHA Stage 3 Flats 15

Heat Demand Categories

Figure 28 categorises the nature and ownership of key heat loads within the network based on the total heat demand. 34% of the heat demand is owned by the private sector and 40% arises from planned developments. The majority of heat demand (24%) arises from social housing.



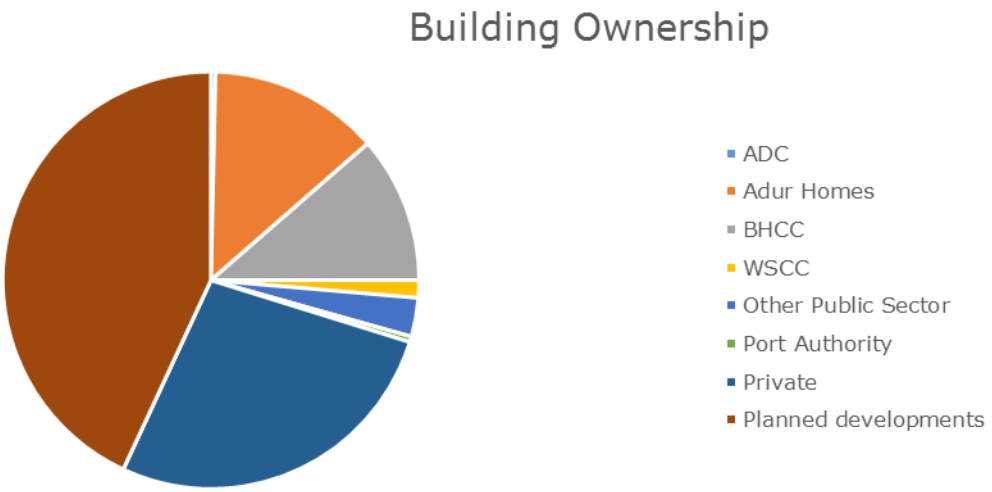


Figure 28: Scenario A phase 3 building use and ownership heat demand categories

Hourly Heat Demand Profile

The heat losses for phase 3 of the network were calculated as 15,267 MW and added onto the total heat demand profile. These losses equate to 11% of the total network demand. The hourly heat demand profile showing the average, maximum and minimum heat demands for the network is shown in Figure 29. The peak heat demand can be seen as approximately 52 MW occurring at 8.00am. Daily profiles for a winter and summer month are shown in Appendix 4 – Heat Demand Modelling.

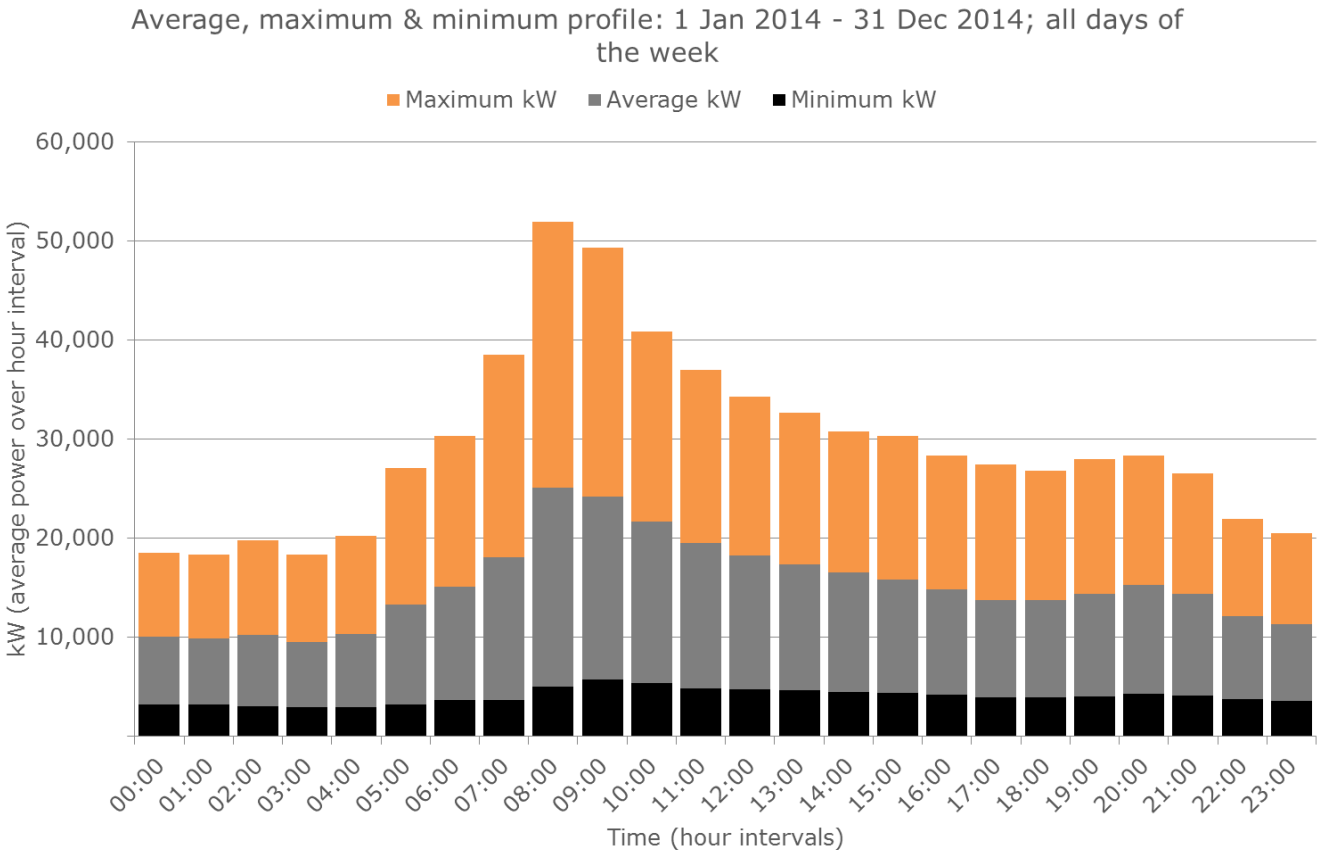


Figure 29: Scenario A phase 3 average daily heat demand

Technology Appraisal

The results from the technology appraisal for the phase 3 network are shown in Table 14. The financial inputs used in the models are shown in section 4.1.

Table 14: Scenario A phase 3 technology appraisal

Financial case period		25 years	40 years
Heat offtake from Edgeley Green		25 MW	
% heat supplied by Edgeley Green		90%	
% heat supplied by peak and reserve		10%	
Capital expenditure	**Technology costs**	£4,651,500	
	Network costs	£34,343,306	
	Total	£38,994,806	
IRR		7%	9%
Net present value		£20,925,870	£48,241,221
Payback		13 years	13 years
Total income		£94,973,063	£182,704,827
Carbon savings		24,968 tonnes	

If the majority of potential heat demands connect to the network then, under the assumptions stated in Table 5, there may be a marginal but potentially viable financial case for the phase 3 network.

Energy Centre
The peak and reserve energy centre or energy centres would require a combined land area of 1,800m^2, an additional requirement of 600m^2 on phase 2. The location or locations of the boilers will be dictated by available space and land ownership (as outlined in 3.2.1).

Multiple energy centres have been considered but the focus on the single energy centre arises from the requirement for low cost heat for network viability. The approach reflects the requirements of EGPS; the clusters at the extremities have been included to demonstrate the maximum potential for network heat demand (and the high risks associated with using the river bridges are considered in section 4.2) without compromising technical or financial viability. As stated, EGPS requires a large network demand in order to receive the benefits associated with Good Quality CHPQA that will allow the sale of low cost heat to the network (and potentially promote / part fund the development of the network).

Timescale
This phase expands the phase 2 network connecting to additional existing heat loads and includes the potential development of Shoreham Airport and development stages 2 and 3 of the Western Harbour Arm which may be complete by approximately 2035.

Key Network Risks and Considerations
This network option warrants further investigation and high level financial case sensitivity, risk and governance options will be further assessed using the techno-economic model. The main network risks include connection risk, potential transport disruption caused by developing the network, crossing the railway line and the River Adur to connect to the Shoreham Airport development and Ricardo Technical Centre and locating the energy centre in a space confined area.

As 40% of heat demand is from planned developments, as stated, effective early engagement with the developers is essential.

3.2.4 Scenario A Summary

A summary of the Scenario A networks is shown in Table 15.

Table 15: Summary of scenario A phases

Phase	Network trench length	No. heat loads	Estimated CAPEX	25 Year Financial Case				Potential completion	Area for energy centre(s)
				Payback	IRR	NPV	Carbon savings		
1	12.5km	201	£18,289,822	13 years	7%	£8,271,631	11,131 tonnes	2020	800m^2
2	19.5km	274	£28,351,373	13 years	7%	£15,197,019	18,040 tonnes	2020	1,200m^2
3	29km	384	£38,994,806	13 years	7%	£20,925,870	24,968 tonnes	2035	1,800m^2

If the majority of potential heat demands connect to the network and then, under the assumptions stated in Table 5, there may be a marginal but potentially viable financial case for all network phases.

As there is a significant land requirement in a confined area there may be more than one location required for peak and reserve boilers. Potential locations for peak and reserve gas boilers include the EGPS site and WSCC owned land. The location and operation of peak and reserve boilers will require further assessment at the feasibility stage.

Key risks include the development of EGPS, connection risk, accessing the tunnel to take pipes beneath the canal, crossing the railway line, the potential transport disruption caused by developing the network and locating the energy centre. The risks and approach to engaging with developers are further assessed in 4.2 and 5 respectively.

Additional Heat Loads
Many of the heat demands are relatively small and inconsistent and do not provide a large base load for a heat network. Without these key anchor loads with consistent heat demand, network viability relies on scale i.e. a large number of small heat demands.

To improve the viability of the network options presented, key anchor loads with consistent demands could be developed. A viable option may be a circa 5MW woodchip belt drying plant capable of drying 15 tonnes of woodchip per hour (55%-40% moisture content). The plant would cost approximately £570,000 and would be 18m in length, 12m in width and 7m in height. The annual heat demand would be ~40,000MWh, the majority of which could be provided by the network options presented above[30]. If a development of this nature could be located within 1km of the site then this would significantly improve the IRR to potentially over 10%[31].

There is a Stobart Biomass Products Ltd export facility 800m to the east of the EGPS site where mainly dry construction waste (15% moisture content) is stored for export to Northern Europe and Scandinavia for use in biofuel CHP plants. This wood does not require drying but it may be pertinent to discuss the wood fuel drying opportunity with the company as they also distribute wood fuels of higher moisture contents that require drying.

[30] Phase 1 - 94%, Phase 2 - 93% and Phase 3 – 87%.
[31] Dependent upon heat sales tariff.

3.3 Scenario B: Alternative Heat Sources

In the event that EGPS is not constructed the technology appraisals for scenario B consider alternative potential heat sources. The technology costs include the costs of the alternative heat source (and auxiliary peak and reserve plant) except for technology appraisals for biofuel CHP where it has been assumed that heat would be sold to the network at a fixed cost (as in scenario A).

3.3.1 Alternative Potential Heat Sources

High level technical viability considerations of potential heat sources is summarised in Table 16.

Table 16: Alternative heat sources

Technology	High level technical viability considerations	Further assessment?
Anaerobic digestion	• Availability of feedstocks unclear • Feedstocks may not be required to be transported through Port and may rule out Port location (with little possibility of locating elsewhere) • Unlikely to be available space for plant footprint within the network area • Scale of technology not large enough to serve demands of large network • Potential odour issues • Water temperatures compatible with existing building operating conditions and delivers required water temperatures to buildings (up to 85°C)	No
Biomass heat	• Consistent heat demand • Compatible with existing operating conditions and delivers required water temperatures to buildings (up to 85°C) • Maybe available space within the network area • Potentially cost effective carbon reduction technology (£ per tonne carbon) • Potential planning issues to locate at Port site (fuel would need to come via the port) • Potential air quality issues • Uncertainty of future RHI	Yes
Biofuel CHP	• May be compatible with existing operating conditions and delivers required water temperatures to buildings (up to 85°C) • Potentially cost effective carbon reduction technology (£ per tonne carbon) • May be available space within port area • Potential planning issues to locate at Port site (fuel would need to come via the port) • Potential air quality issues • Space confined area • Opportunity to influence plant operation in relation to heat provision as part of planning consent • Uncertainty of future RHI	Yes – in context of private sector developer
Energy from Waste	• Unlikely to be available space within the network area • Potential planning issues to locate at Port site (feedstock would need to come via the port) • *Potentially* compatible with existing operating conditions • Air quality issues • Likely to me by public opposition	No

Gas CHP	• Suited to urban location (potentially available fuel supply) • Electricity users in close proximity (potential for private wire although high risk associated with residential and industrial connections) • Compatible with existing operating conditions and delivers required water temperatures to buildings (up to 85°C) • Potential improved financial viability achieved through power sales • Likely to be available space within the network area	Yes
Geothermal	• The geothermal heat flow value for the Shoreham area is 50-60 mW/m^2 and is unlikely to present a viable opportunity[32] • Deep drilling complicated by contaminated land issues • Uncertainty of RHI	No
Ground source heat pump	• Difficult ground conditions due to groundwater and contaminated land • Lower water temperatures may not be initially suitable for existing buildings, however may be suitable for planned developments • Very limited land availability for horizontal array • Uncertainty of RHI	No
Marine source heat pump	• Significant water resource within feasible proximity to heat map area from River Adur, canal basin and English Channel • Lower water temperatures may not be initially suitable for existing buildings however may be suitable for planned developments • Average sea temperatures in Shoreham range from approximately 8-17°C[33] • DECC water source heat map[34] indicates that there may be an opportunity at the site • Uncertainty of RHI	Yes

3.3.2 Scenario B, Phase 1a

The Network

Phase 1a of the scenario B network options is shown in Figure 30 and a summary of the network is provided in Table 17. This embryo network includes the potential developments of stage 1 of the Western Harbour Arm and the Adur Civic Centre and car park. These planned developments have the highest linear heat density within the heat map area and this small network option has been included to highlight the potential viability to planners and developers if these developments are brought forward prior to any plans for a larger district energy scheme being progressed.

Futureproofing measures have been considered to allow for phased future developments and the operating conditions assume that the developments are 'district heating ready'; as stated in Scenario A, target distribution flow temperatures will be 70°C and return temperatures may be optimised to 40°C. When this network is developed into a larger network serving older, less thermally efficient buildings (with potential distribution flow temperatures of 85°C and return temperatures targeted at 55°C) the temperature to the phase 1a section could be stepped down as part of a shunt circuit (that may require a small pump room or heat exchanger in the network).

[32] Figure from British Geological Survey heat flow map http://www.bgs.ac.uk/research/energy/geothermal/
[33] Temperatures from http://www.seatemperature.org/europe/united-kingdom/shoreham-by-sea-july.htm
[34] DECC High level water source heat map:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/353979/decc_water_source_heat_map.pdf

Table 17: Scenario B, Phase 1a network summary

No. heat loads	Trench length	Total heat demand	Peak heat demand	Heat losses	Key heat loads	Date
32	1.7km	17,306 MWh	8 MW	5%	- Western Harbour Arm Flats 1, 2, 5, 6, 9, 10 & 21 planned developments - Adur Civic Centre redevelopment	2020

Figure 30: Scenario B phase 1a pipe route and energy centre location

Figure 31 shows the phase 1a potential key heat load locations, ownership, heat demands and pipe route. Table 18 lists the heat demands numbered in Figure 31.

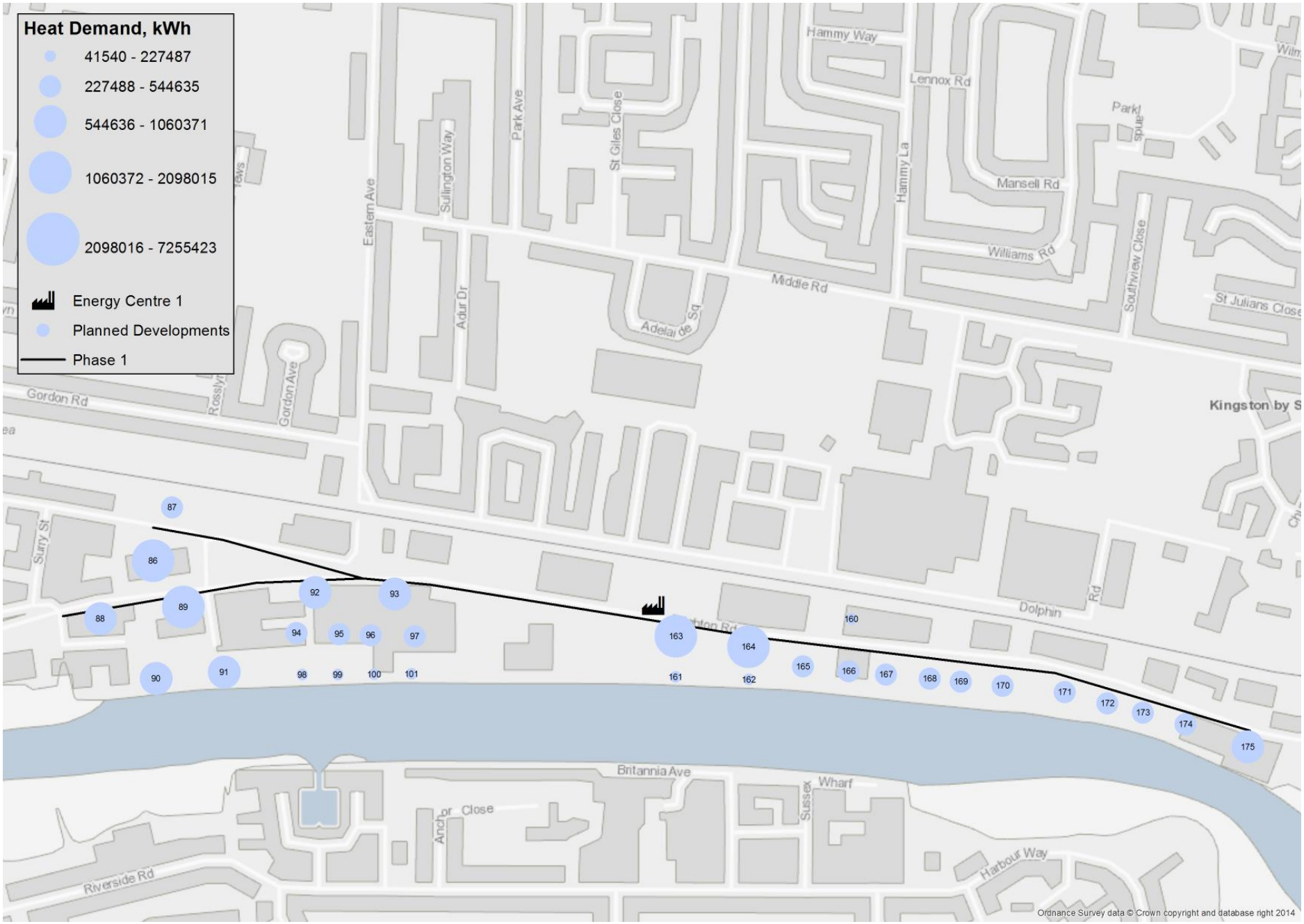


Figure 31: Scenario B phase 1a

Table 18: Building identifications for scenario B phase 1a

Site ID	Building Name	Site ID	Building Name
86	Adur Civic Centre	160	Lidl Development
87	Adur Civic Centre Car Park	161	Western Harbour Arm Employment 9
88	Western Harbour Arm Flats 1	162	Western Harbour Arm Employment 10
89	Western Harbour Arm Flats 2	163	Western Harbour Arm Flats 9
90	Western Harbour Arm Flats 3	164	Western Harbour Arm Flats 10
91	Western Harbour Arm Flats 4	165	Western Harbour Arm Flats 11
92	Western Harbour Arm Flats 5	166	Western Harbour Arm Flats 12
93	Western Harbour Arm Flats 6	167	Western Harbour Arm Flats 13
94	Western Harbour Arm Housing 1	168	Western Harbour Arm Flats 14
95	Western Harbour Arm Housing 2	169	Western Harbour Arm Flats 15
96	Western Harbour Arm Housing 3	170	Western Harbour Arm Flats 16
97	Western Harbour Arm Housing 4	171	Western Harbour Arm Flats 17
98	Western Harbour Arm Employment 1	172	Western Harbour Arm Flats 18
99	Western Harbour Arm Employment 2	173	Western Harbour Arm Flats 19
100	Western Harbour Arm Employment 3	174	Western Harbour Arm Flats 20
101	Western Harbour Arm Employment 4	175	Western Harbour Arm Flats 21

Heat Demand Categories

Figure 32 categorises the nature and ownership of key heat loads within the network based on the total heat demand. 100% of the heat demand arises from potential developments (mainly residential). The ownership of these planned developments once built is currently unknown.

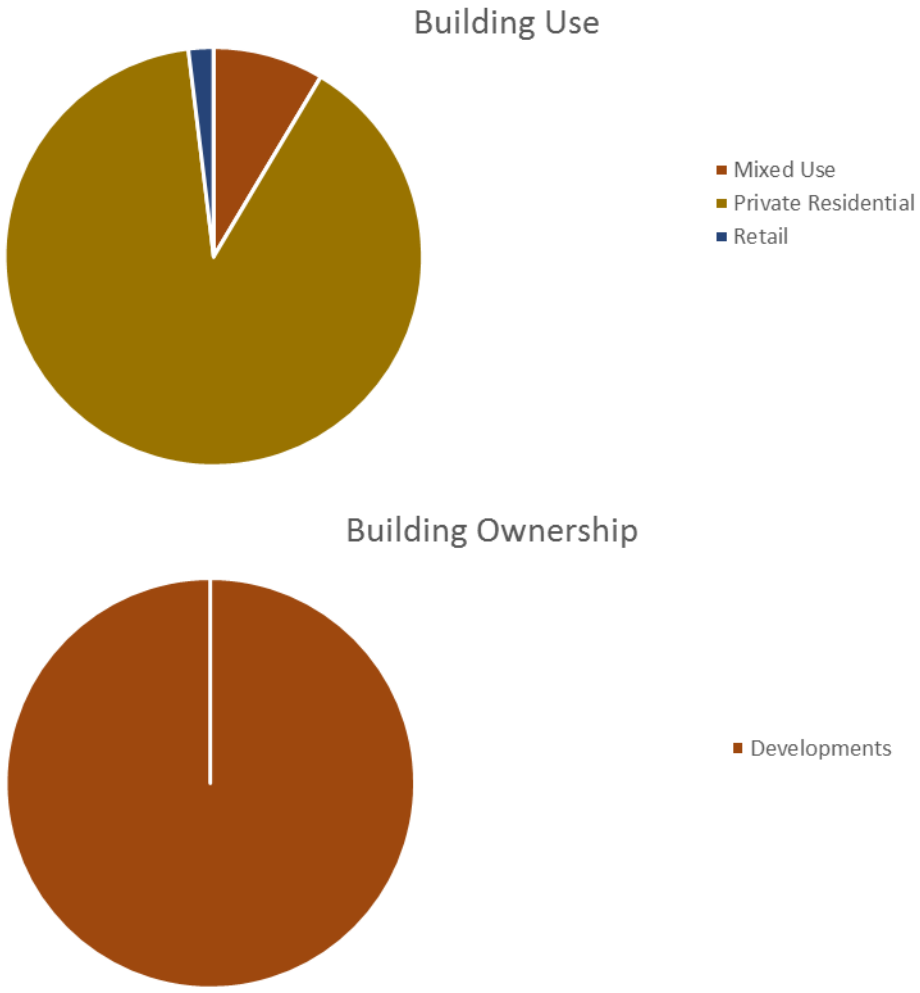


Figure 32: Scenario B phase 1a building use and ownership heat demand categories

Hourly Heat Demand Profile

The hourly heat demand profile showing the average, maximum and minimum heat demands for the network over 24 hours is shown in Figure 33. The peak heat demand can be seen as approximately

7.7 MW occurring at 8am. Daily profiles for a winter and summer month are shown in Appendix 4 – Heat Demand Modelling.

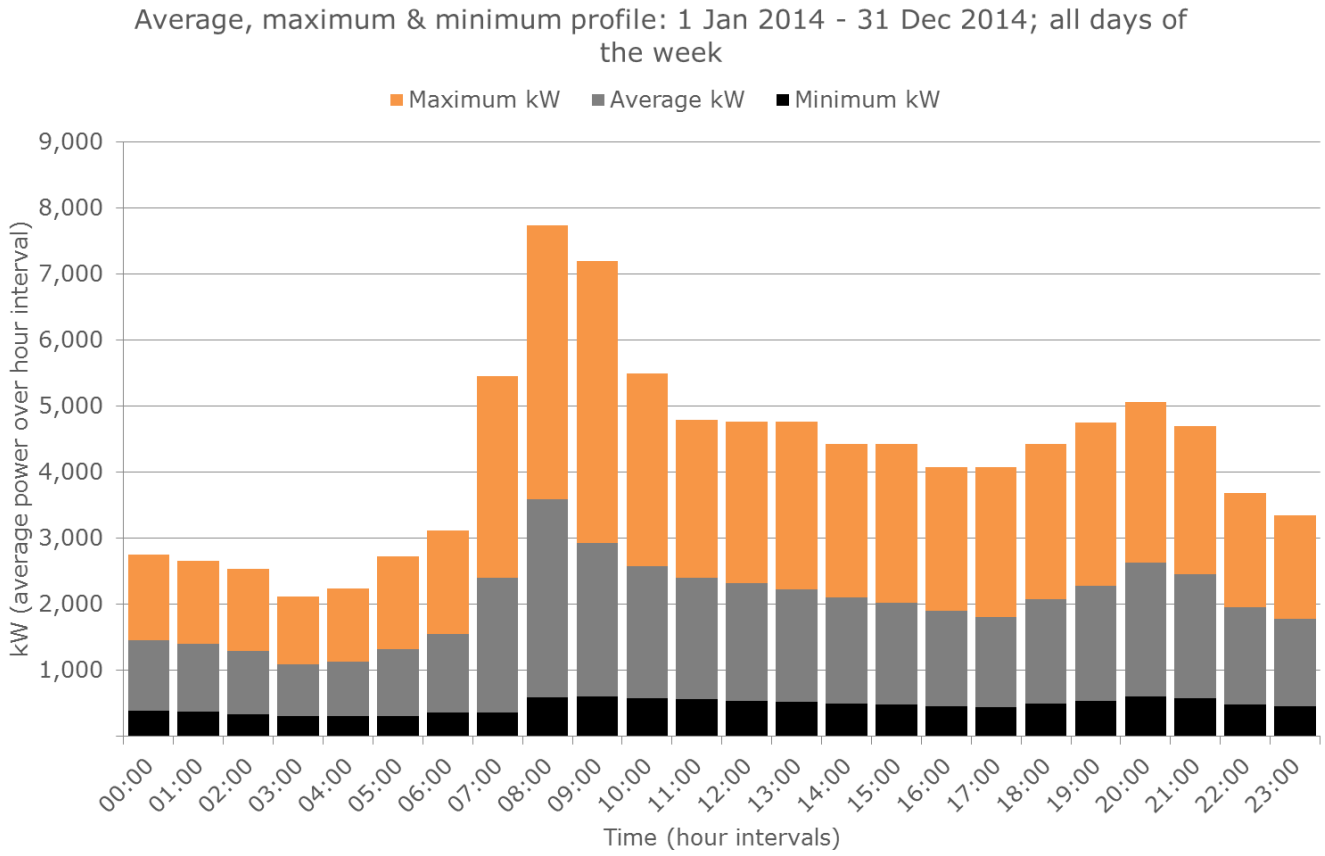


Figure 33: Scenario B phase 1a average daily heat demand

Technology Appraisal
The results from the technology appraisal for the phase 1a network are summarised in Table 19 and the less viable technologies assessed summarised in Appendix 6 – Financial Viability Assessments.

Table 19: Scenario B phase 1a technology appraisal

Technology		Gas CHP	MSHP (with RHI)	MSHP (without RHI)
Heat output		3 MW	3 MW	
% heat supplied by technology		89%	92%	
% heat supplied by auxiliary		11%	8%	
Electricity output		2.1 MW	N/A	
Capital expenditure	**Technology costs**	£2,643,900	£4,056,000	
	Network costs	£2,383,505	£2,179,305	
	Total	£5,027,405	£6,235,305	
IRR		8%	9%	N/A
Net present value		£3,393,328	£3,415,218	-£7,940,876
Payback		12 years	10 years	>25 years
25 year income		£13,346,692	£13,733,444	-£2,703,295
Carbon savings		3,700 tonnes	1,463 tonnes	

If the majority of potential heat demands connect to the network then, under the assumptions stated in Table 5, there may be a viable financial case for the phase 1a network served by gas CHP or MSHPs (receiving RHI at current levels).

MSHP
The 25 year and 40 year high level financial cases for a MSHP are shown in Table 21.

Table 20: 25 and 40 year high level financial cases for scenario B phase 1a - MSHP (with RHI)

Financial case period		25 years	40 years
Heat output		3 MW	
Electricity output		N/A	
Capital expenditure	**Technology costs**	£4,056,000	
	Network costs	£2,179,305	
	Total	£6,235,305	
IRR		9%	6%
Net present value		£3,415,218	£976,423
Payback		10 years	11 years
Total income		£13,733,444	£7,755,420
Carbon saving		1,463 tonnes	

As stated, the MSHP option requires the revenue associated with current RHI tariffs. If the scheme does not receive RHI support at 80% of the current rate, the IRR is reduced to below 5%. As the RHI is currently under review, there are very high risks associated with this revenue and so the option is unlikely to be viable.

Gas CHP
The 25 year and 40 year high level financial cases are shown in Table 20.

Table 21: 25 and 40 year high level financial cases for scenario B phase 1a - gas CHP

Financial case period		25 years	40 years
Heat output		3 MW	
Electricity output		2.1 MW	
Capital expenditure	**Technology costs**	£2,643,900	
	Network costs	£2,838,505	
	Total	£5,027,405	
IRR		8%	7%
Net present value		£3,393,328	£4,968,662
Payback		12 years	15 years
Total income		£13,346,692	£23,470,066
Carbon saving		3,700 tonnes	

The gas CHP option requires the revenue associated with private wire[35] agreements in order to be viable.

Table 22 highlights the effect that private wire arrangements have on the gas CHP.

[35] In this report private wire agreements refer to the sale of electricity (generated by a gas CHP scheme) directly to an end user via electrical cables installed during the installation of the heat network.

Table 22: Private wire for gas CHP

Private wire		Base[36]	100% private wire[37]	0% private wire[38]
Heat output		3 MW		
Electricity output		2.1 MW		
Capital expenditure	**Technology costs**	£2,643,900		
	Network costs	£2,383,505	£2,383,505	£2,179,305
	Total	£5,027,405	£5,027,405	£4,823,205
IRR		8%	10%	2%
NPV		£3,393,328	£5,114,339	-£869,043
Payback		12 years	10 years	21 years
25 year income		£13,346,692	£16,074,460	£6,267,268

If private wire agreements for the gas CHP option cannot be arranged then the network will not be financially viable. This option includes private wire agreements to provide electricity to the developments that receive heat from the phase 1a network (and this is reflected in the capital costs for infrastructure).

There are high risks associated with this scenario as private wire agreements with domestic consumers are uncommon in the UK. However, it is deemed as the most viable heat source for this network, and if the scheme was developed by, or in partnership with, community organisations there may be options to sell this power as part of the proposed Sussex Energy Tariff[39].

Energy Centre

The energy centre to accommodate 3MWth gas CHP plant and 7.2MW gas fired auxiliary plant would require a land area of 510m^2. Due to uncertainty over the future configuration of the phased network, the stated land area does not include significant further expansion opportunities.

The energy centre may be located on the previously mentioned WSCC owned land at the recycling centre along the Western Harbour Arm. Data received from Southern Gas Networks confirms that there is a 500mm existing gas main running along Brighton Road. This is likely to have sufficient capacity to support a development of this scale.

Timescale

This phase is reliant on stage 1 of the planned developments of Western Harbour Arm and the redevelopment of the former Adur Civic Centre and car park. These developments are due within the next 5 years and therefore this network has a potential delivery date of 2020.

Key Network Risks and Considerations

[36] Assumes 75% of electricity generated by the CHP plant is exported to grid.
[37] Assumes 100% of electricity demand of the phase 1 energy network (those buildings also receiving heat) is met by private wire, 54% of electricity generated by gas CHP scheme is exported to grid.
[38] Assumes 100% of electricity generated by gas CHP scheme is exported to grid.
[39] This will facilitate the provision of a set of low cost/high value energy tariffs to residents in West Sussex. The procurement of the scheme will be led by West Sussex County Council, working on behalf of Your Energy Sussex (YES) Partners and Community Energy South (CES). The energy tariffs will be used to stimulate, where appropriate, the development of local community energy infrastructure in West Sussex.

The financial viability of this embryo network is marginal and it is unlikely that it will be implemented without effective early engagement with the developers of the Western Harbour Arm and the redevelopment of the former Adur Civic Centre and car park. The approach to engaging with developers and planning is discussed in Chapter 5.

There are significant risks associated with developing the network including engaging with developers, securing private wire arrangements with domestic users, the potential transport disruption caused by developing the network and locating the energy centre in a space confined area. As 100% of potential heat demand comes from private sector, mainly residential developments, connection risk will be very high. If electricity cannot be sold at a competitive rate via private wire and/or the Sussex Energy Tariff, then the network is likely to be unviable.

This network option is further investigated and high level financial case sensitivity and risk is further assessed in Chapter 4.

3.3.3 Scenario B, Phase 1b

The Network

An alternative phase 1 network is shown in Figure 34 and a summary of the network is provided in Table 23. Phase 1a is expanded to connect to existing buildings including social housing at Southwick Waterfront and Fishergate, Southwick Community Association, Eastbrook Primary Academy and Shoreham Leisure Centre.

Table 23: Scenario B, Phase 1b network summary

No. heat loads	Trench length	Total heat demand	Peak heat demand	Heat losses	Key heat loads	Date
97	6.4 km	32,296 MWh	13 MW	10%	- Western Harbour Arm Flats 1, 2, 5, 6, 9, 10 & 21 planned developments - Adur Civic Centre redevelopment - Eastbrook Primary Academy (north site)	2020

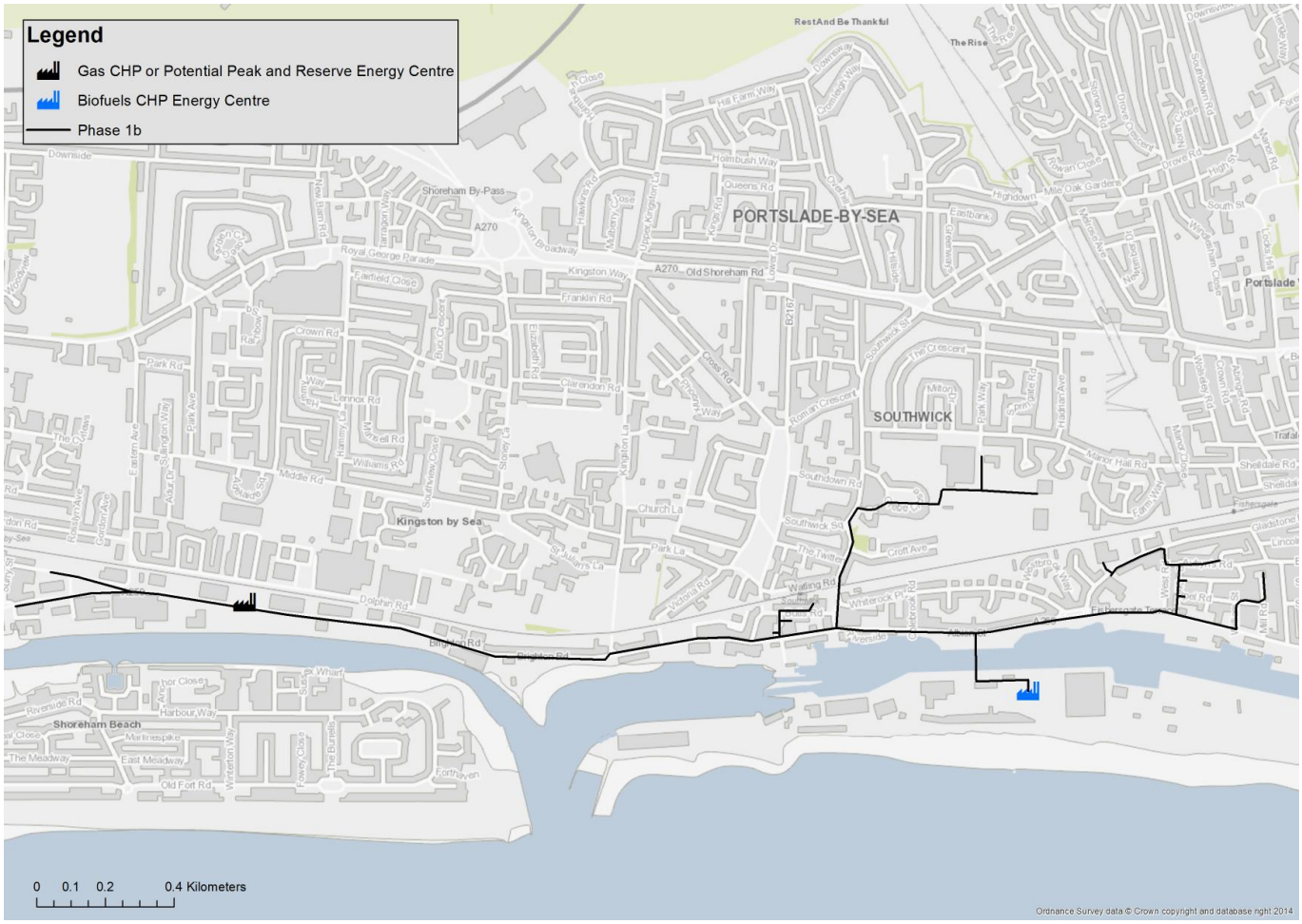


Figure 34: Scenario B phase 1b pipe route and energy centre location

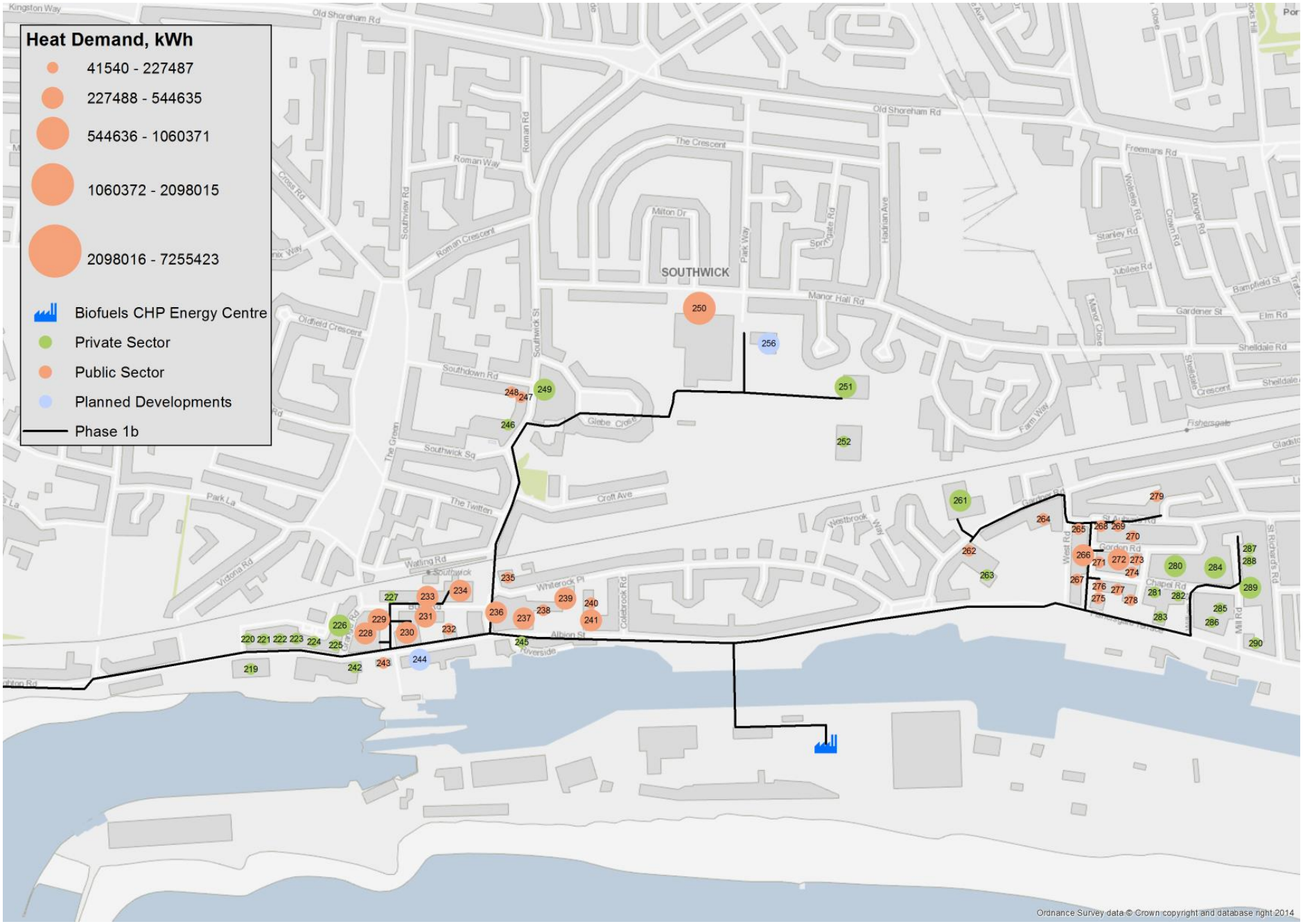


Figure 35: Eastern section of scenario B phase 1b

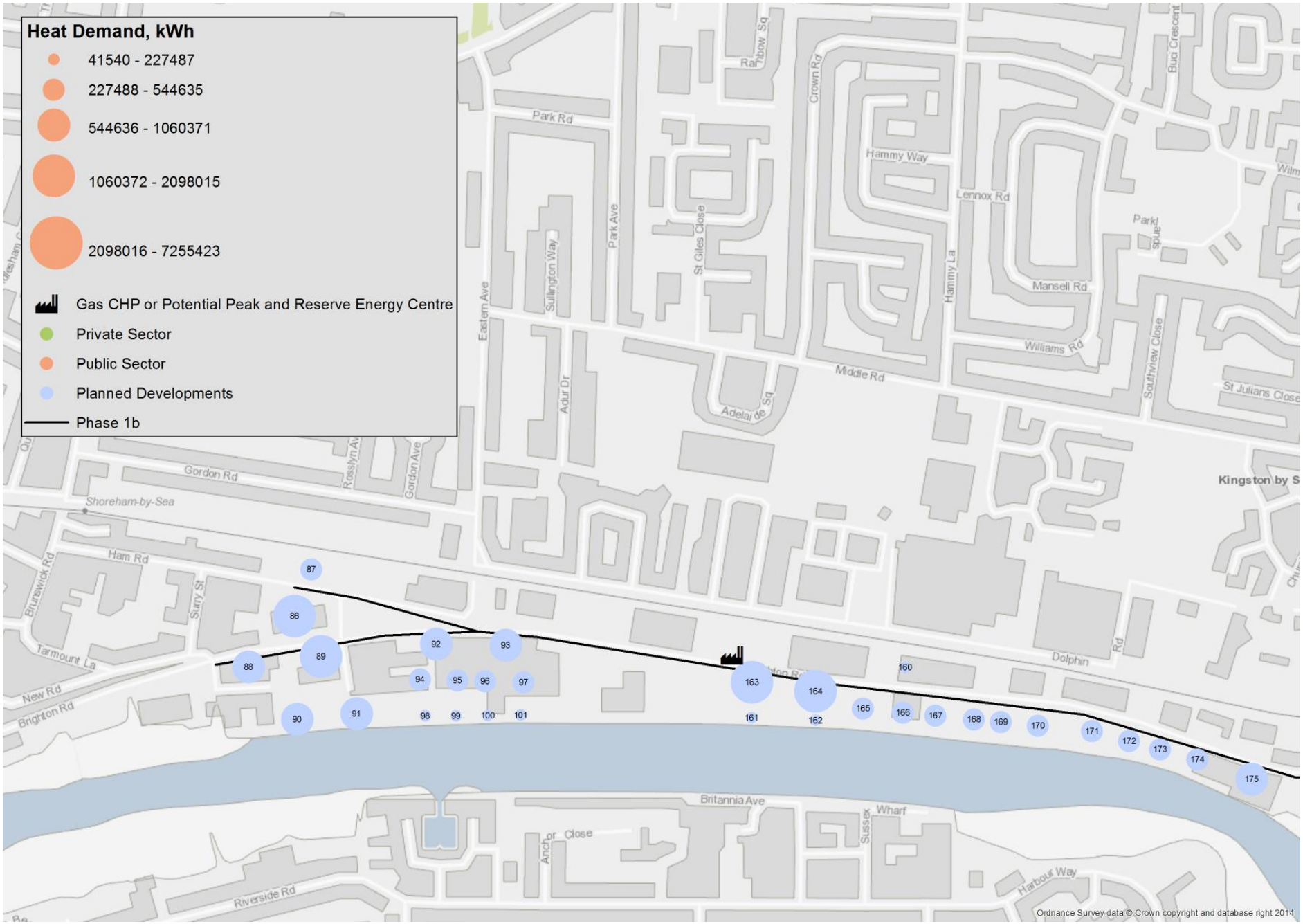


Figure 36: Western section of scenario B phase 1b

Table 24: Building identifications for scenario B phase 1b

Site ID	Building Name	Site ID	Building Name
86	Adur Civic Centre	236	Rock Close, building 2
87	Adur Civic Centre Car Park	237	Rock Close, building 1
88	Western Harbour Arm Flats 1	238	Channel View
89	Western Harbour Arm Flats 2	239	Sea House
90	Western Harbour Arm Flats 3	240	Harbour Court
91	Western Harbour Arm Flats 4	241	Albion House
92	Western Harbour Arm Flats 5	242	Dudman Offices
93	Western Harbour Arm Flats 6	243	Nautilus House, Port Authority Offices
94	Western Harbour Arm Housing 1	244	Southwick Waterfront, Lady Bee Marina
95	Western Harbour Arm Housing 2	245	Old Town Hall
96	Western Harbour Arm Housing 3	246	PB Law solicitors
97	Western Harbour Arm Housing 4	247	Doctors Surgery, Manor Practise
98	Western Harbour Arm Employment 1	248	Southwick Library
99	Western Harbour Arm Employment 2	249	Southwick Community Association
100	Western Harbour Arm Employment 3	250	Eastbrook Primary Academy (North site)
101	Western Harbour Arm Employment 4	251	Leisure Centre
160	Lidl Development	252	Indoor Bowling Club
161	Western Harbour Arm Employment 9	256	Land Adjacent to Eastbrook Academy
162	Western Harbour Arm Employment 10	261	Nyenex House
163	Western Harbour Arm Flats 9	262	Stepping Stones Children Family Centre, Council Health Centre
164	Western Harbour Arm Flats 10	263	Community Centre Fishergate
165	Western Harbour Arm Flats 11	264	Eastbrook Primary Academy (South Site)
166	Western Harbour Arm Flats 12	265	Westlands Court, building 1
167	Western Harbour Arm Flats 13	266	Westlands Court, building 2
168	Western Harbour Arm Flats 14	267	Westlands Court, building 3
169	Western Harbour Arm Flats 15	268	5-8 Laylands road
170	Western Harbour Arm Flats 16	269	Wyck Court, building 1
171	Western Harbour Arm Flats 17	270	Wyck Court, building 2
172	Western Harbour Arm Flats 18	271	Laylands Court, building 1
173	Western Harbour Arm Flats 19	272	Laylands Court, building 2
174	Western Harbour Arm Flats 20	273	Laylands Court, building 3
175	Western Harbour Arm Flats 21	274	Laylands Court, building 4
219	Dudman Aggregate	275	Old Mill Close, building 1
220	Grange Industrial Estate, Coppard plant hire	276	Old Mill Close, building 2
221	Grange Industrial Estate, Southover Food Company	277	Old Mill Close, building 3
222	Grange Industrial Estate, The Tile Source, Showroom	278	Old Mill Close, building 4
223	Grange Industrial Estate, Eyre & Elliston, Electrical Distributors	279	Summer Close
224	Grange Industrial Estate, Wemoto, motorcycle parts	280	Big Box Self Storage
225	Grange Industrial Estate, Optimum Kitchen Appliance Centre	281	Tungsten Buildings, 12 units
226	Wyndeham Grange, Printers	282	Greg Stone, flooring
227	Wyndeham Grange, Offices	283	R&D Goatley Ltd
228	Locks Court	284	Kew Electrical
229	Grange Court	285	Chapel Road, Warehouse units
230	Coates Court, building 1	286	Johnsons Apparel Master
231	Coates Court, building 2	287	Mill Road Industrial Estate
232	Coates Court, building 3	288	Adams Packaging
233	Watling Court, building 2	289	Southdown Construction Ltd, Fishergate Forge
234	Watling Court, building 1	290	The Adenstar Group offices
235	Spring Gardens		

Heat Demand Categories
Figure 42 categorises the nature and ownership of key heat loads within the network based on the total heat demand. 59% of heat demand is from planned developments and 53% of demand arises from private residential use.

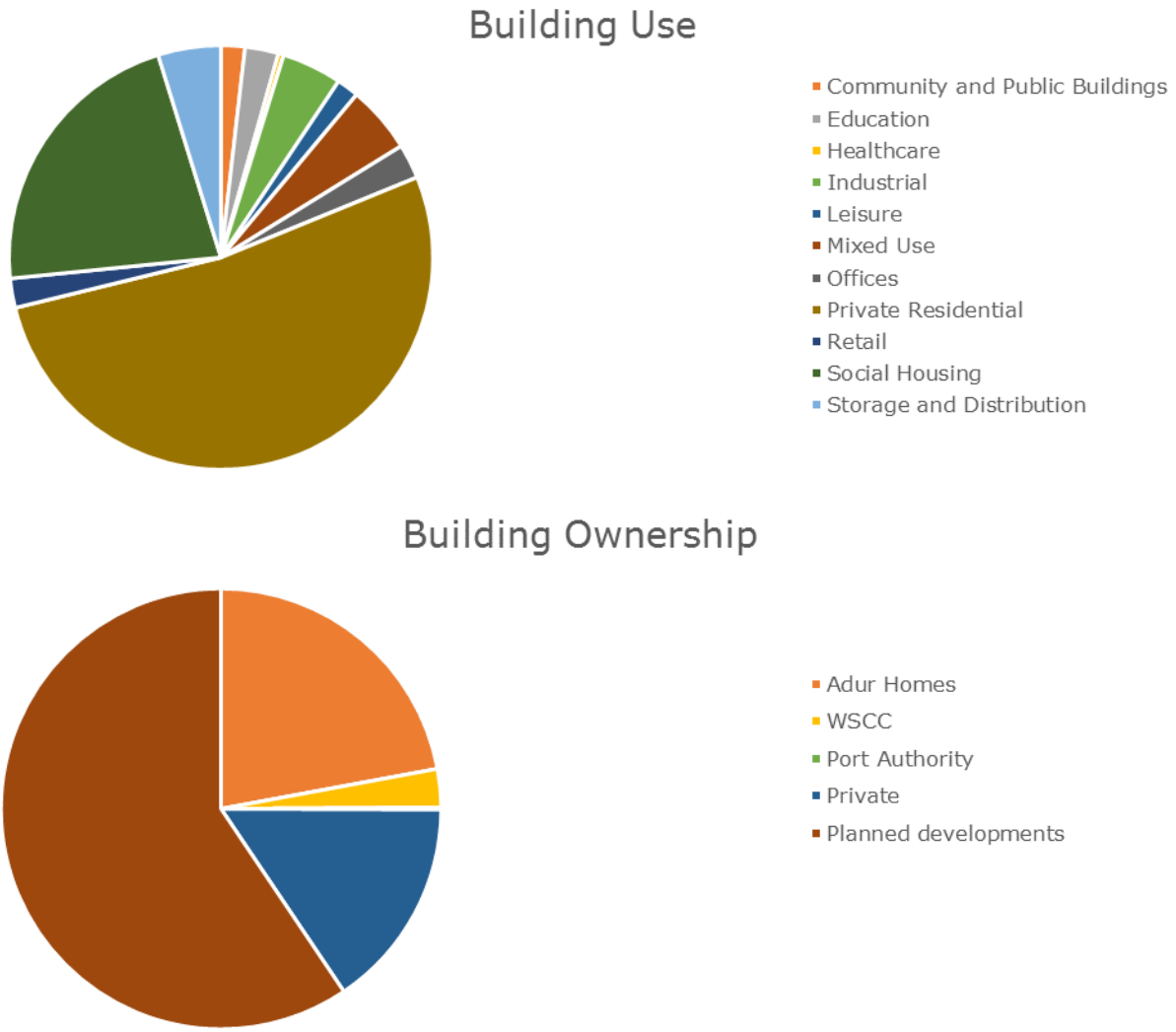


Figure 37: Scenario B phase 1b building use and ownership heat demand categories

Hourly Heat Demand Profile
The heat losses for phase 1b of the network were calculated as 3,272 MW and added onto the total heat demand profile. These losses equate to 10% of the total network demand. The hourly heat demand profile showing the average, maximum and minimum heat demands for the network is shown in Figure 38. The peak heat demand is approximately 13MW and occurs at 8am. Daily profiles for a winter and summer month are shown in Appendix 4 – Heat Demand Modelling.

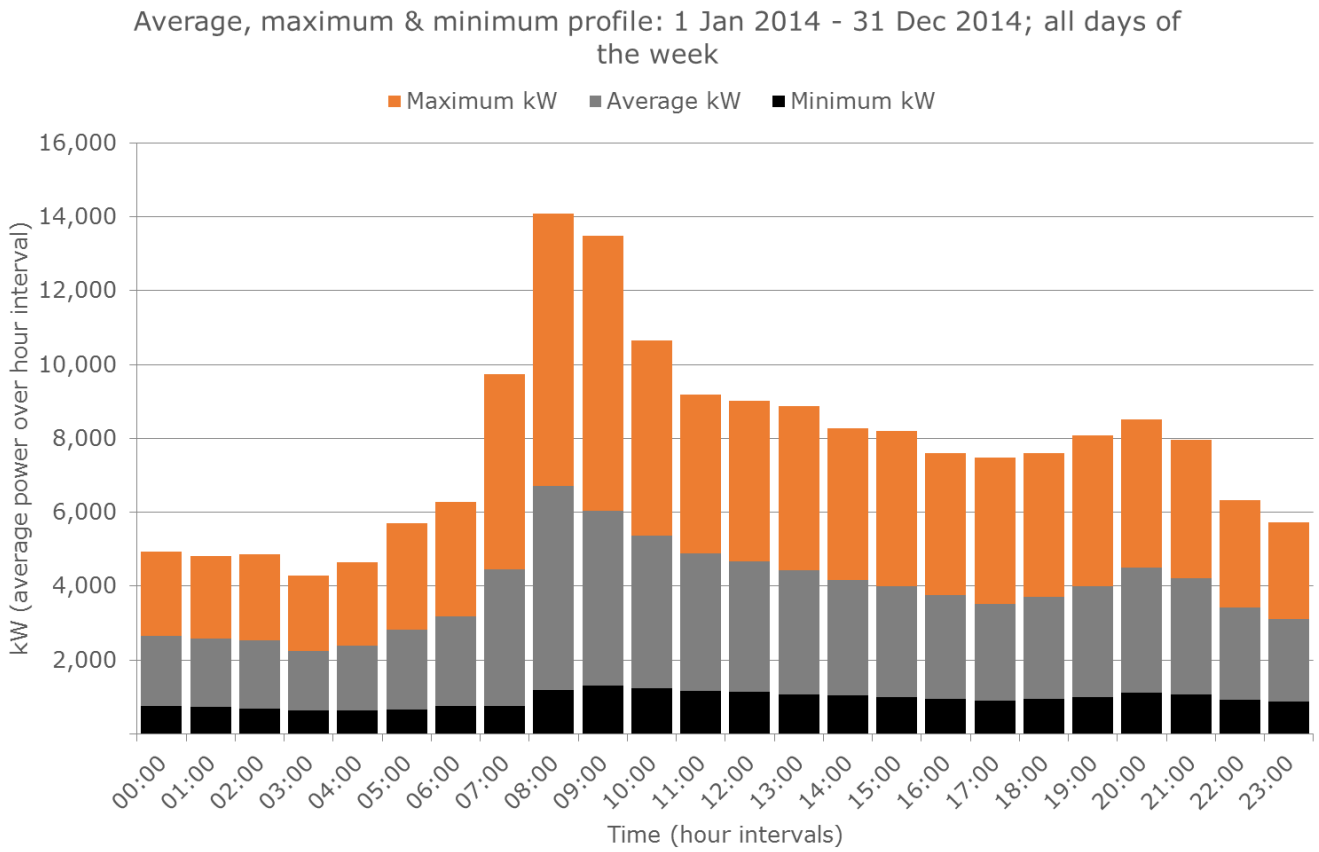


Figure 38: Scenario B phase 1b average daily heat demand

Technology Appraisal

The results from the technology appraisal for the phase 1b network are shown in Table 25 (with the other less viable options assessed included in Appendix 6 – Financial Viability Assessments.

Table 25: Scenario B phase 1b technology appraisal

Technology		Gas CHP	Biofuel CHP
Heat output		6 MW	>13 MW
% heat supplied by technology		95%	95%
% heat supplied by auxiliary		5%	5%
Electricity output		4.2 MW	-
Capital expenditure	**Technology costs**	£4,602,700	£1,186,500
	Network costs	£8,500,364	£7,682,664
	Total	£13,103,064	£8,869,164
IRR		4%	9%
Net present value		£1,177,553	£6,798,594
Payback		17 years	11 years
25 year income		£22,634,491	£24,833,081
Carbon savings		6,953 tonnes	6,459 tonnes

If the majority of potential heat demands connect to the network then, under the assumptions stated in Table 5, there may be very marginal viability for the phase 1b network served by gas CHP and a potentially viable financial case for a biofuel CHP plant selling heat to the network (in the same manner and at the same tariff rate as EGPS).

Gas CHP

Table 26 shows the effect that private wire arrangements have on the 25 year high level financial case for the 6MWth gas CHP.

Table 26: Private wire for 6MWth gas CHP

Private wire		Base[40]	100% private wire[41]	0% private wire[42]
Heat output		6 MW		
Electricity output		4.2 MW		
Capital expenditure	**Technology costs**	£4,602,700		
	Network costs	£8,500,364	£8,500,364	£7,782,664
	Total	£13,103,064	£13,103,064	£12,285,364
IRR		4%	6%	-1%
NPV		£1,177,553	£4,183,013	-£5,804,870
Payback		17 years	14 years	>25 years
25 year income		£22,634,491	£27,398,084	£10,271,453

If private wire contracts for the gas CHP option cannot be secured then the network is not viable. This option assumes that there are private wire agreements to provide electricity to the end users associated with the phase 1b energy network (and this is reflected in the capital costs). As there are very high connection risks and, at best, a marginal financial case for this option it is deemed unviable.

Biofuel CHP

As stated, the most viable financial case for this network option is achieved when heat is purchased from a biofuel CHP plant. This option assumes that heat is sold to the network by a third party operator at the same tariff used in the EGPS options[43]. EGPS is the only planned biofuel CHP plant for the heat map area but, in the event that EGPS is not developed, this option assesses the financial viability of heat supply from a theoretical plant located at the EGPS site within the next five years.

It is assumed that the feedstock for the plant would be bio-liquid or woodchip that would be transported through the Port[44]. The 25 and 40 year financial cases for this option are outlined in Table 27.

Table 27: 25 and 40 year high level financial case for Biofuel CHP

Financial case period		25 years	40 years
Heat output		>13 MW	
Electricity output		N/A	
Capital expenditure	**Technology costs**	£1,186,500	
	Network costs	£7,682,664	
	Total	£8,869,164	
IRR		9%	10%
Net present value		£6,798,594	£13,955,238
Payback		11 years	12 years
Total income		£24,833,081	£47,802,823
Carbon saving		6,459 tonnes	

Energy Centre

The proposed location for the plant / power station is potentially large enough to accommodate an installation of the scale required but if the site footprint was deemed to be too small then feedstocks

[40] Assumes 75% of electricity is exported to grid.
[41] Assumes 100% of electricity demand of the phase 1b energy network (those buildings also receiving heat) is met by private wire and 59% of electricity generated by gas CHP scheme is exported to grid.
[42] Assumes 100% of electricity generated by gas CHP scheme is exported to grid.
[43] Assumes heat is sold to the network at £5/MWh.
[44] If a biofuel CHP plant is to be located in the Port Authority area, then it will have to be clearly demonstrated to be supporting port related activities and feedstocks such as woodchip will need to be delivered via the Port.

such as woodfuel could be stored at another nearby location and transported to the plant via either a large overhead conveyor or wheel loader type vehicle.

The peak and reserve energy centre for this network phase will require a land area of 475m^2. This land area does not consider significant further expansion of the network, and if the peak and reserve energy centre was to be large enough to serve phase 4 (by 2035) then it will require a land area of 1,516m^2. As stated in scenario A, this is a significant land requirement there may be more than one location for peak and reserve boilers. The operation of the peak and reserve boiler may be the responsibility of main heat provider (HeatCo), or maybe contracted to a third party.

A potential location for a peak and reserve gas boiler would be at the site of the biofuel CHP plant site (especially if the plant is to be owned and operated by biofuel CHP operator) but there is currently only a single gas supply to the main port area south of the A259 and this provides gas at high pressure to SPS. It may not be possible to access this supply and, if this project is progressed to the feasibility stage, this requires further investigation. If an energy centre is to be located in the Port Authority area, then it will have to be clearly demonstrated to be supporting port related activities. As the site is space constrained it may be preferable to locate the peak and reserve plant away from the main Port.

Accessing the mains gas supply will have lower associated risk to the north of the Port and there is a 500mm gas main running along the A259. If the scenario B phase 1b peak and reserve plant is not located at the Port, then it will ideally be located on WSCC land central to the network. WSCC owned land at the recycling centre along the Western Harbour Arm will provide a suitable location (see Figure 34). If this is not viable, then the lorry park near the Southwick Waterfront may provide an alternative. Both of these sites are greater than 3,000m^2 in area.

Timescale
This phase is reliant upon the construction of a biofuel CHP plant for which there are no current plans. All of the planned developments to be served by the network are scheduled to be built out by 2020.

Key Network Risks and Considerations
As there is a relatively low linear heat density in the Shoreham area, a large source of low cost, low carbon heat is required in order to support a viable district heat network opportunity of any significant scale. Due to the nature of the site and the high risk private wire opportunities, a biofuel CHP plant would be the most viable heat source. This plant is likely to be similar to EGPS, primarily generating electricity and operating with a requirement or incentive to deliver useful heat.

As there are currently no plans for a plant of this kind, if EGPS is not developed, there may be an opportunity for the project partners and planners to adopt an enabling role, encouraging new developers to come forward, supporting their activities where appropriate.

The main network risks include the development of a biofuel CHP plant/power station, connection risk, accessing the tunnel to take heat beneath the canal, crossing the railway line, the potential transport disruption caused by developing the network and locating the plant / power station and energy centre in a space confined area.

As the majority of potential heat demand comes from the private sector (mainly residential buildings) and 59% from planned developments, connection risk will be high. The developments along the Western Harbour Arm are key to viability and if they do not connect to the network it is unlikely to be viable.

This network option is further investigated and high level financial case sensitivity and risk is further assessed in Chapter 4.

3.3.4 Scenario B, Phase 2

The Network
Phase 2 of the network is shown in Figure 39 and a summary of the network is provided in Table 28.

Table 28: Scenario B, Phase 2 network summary

No. heat loads	Trench length	Total heat demand	Peak heat demand	Heat losses	Key heat loads	Date
122	7.3 km	48,581 MWh	17 MW	7%	- 79-81 Brighton Road - Western Harbour Arm Flats 1, 2, 9, 10 planned developments - Adur Civic Centre redevelopment - Western Harbour Arm (phase 3) flats 7 & 10	2035

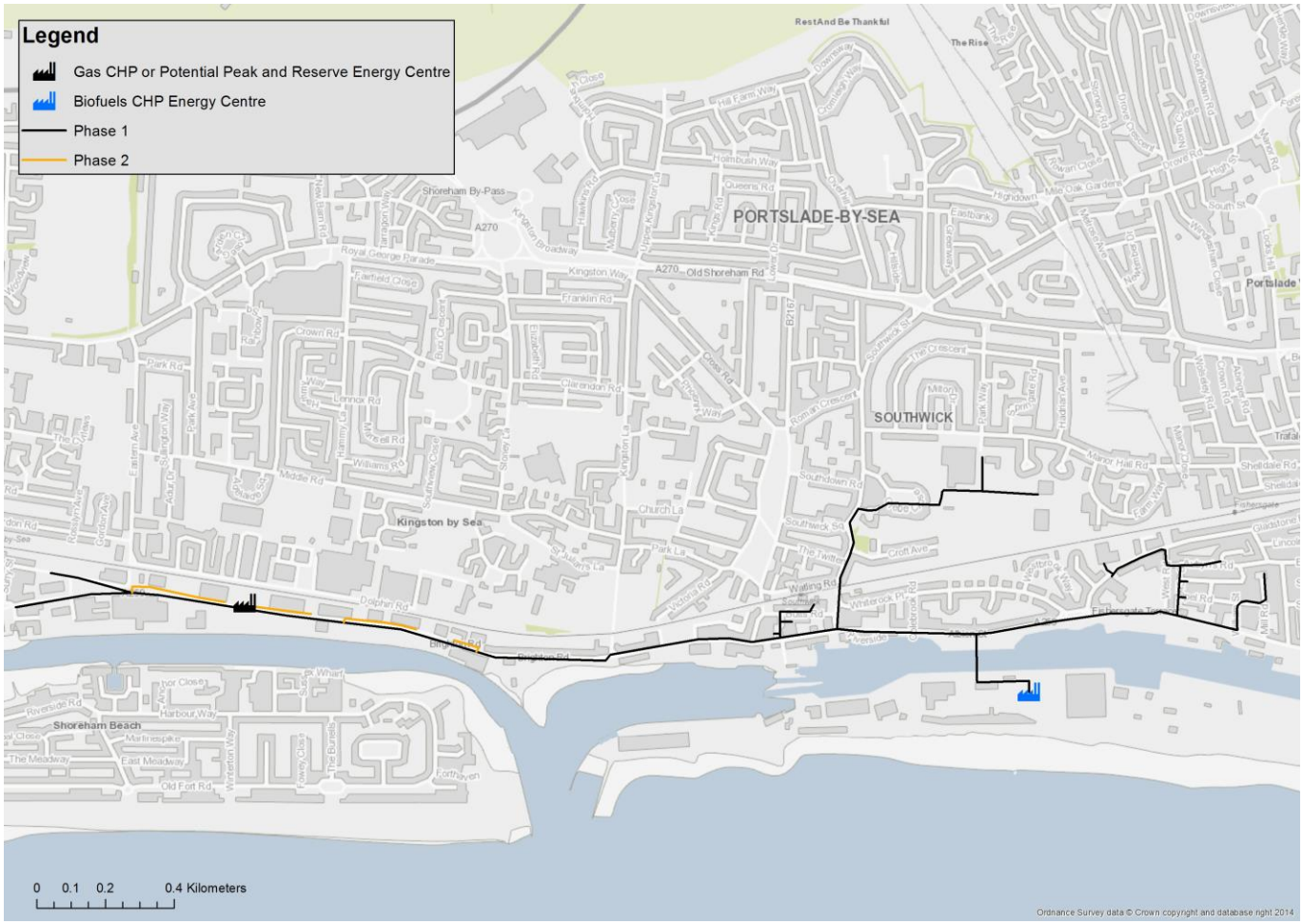


Figure 39: Scenario B phase 2 pipe route and energy centre location

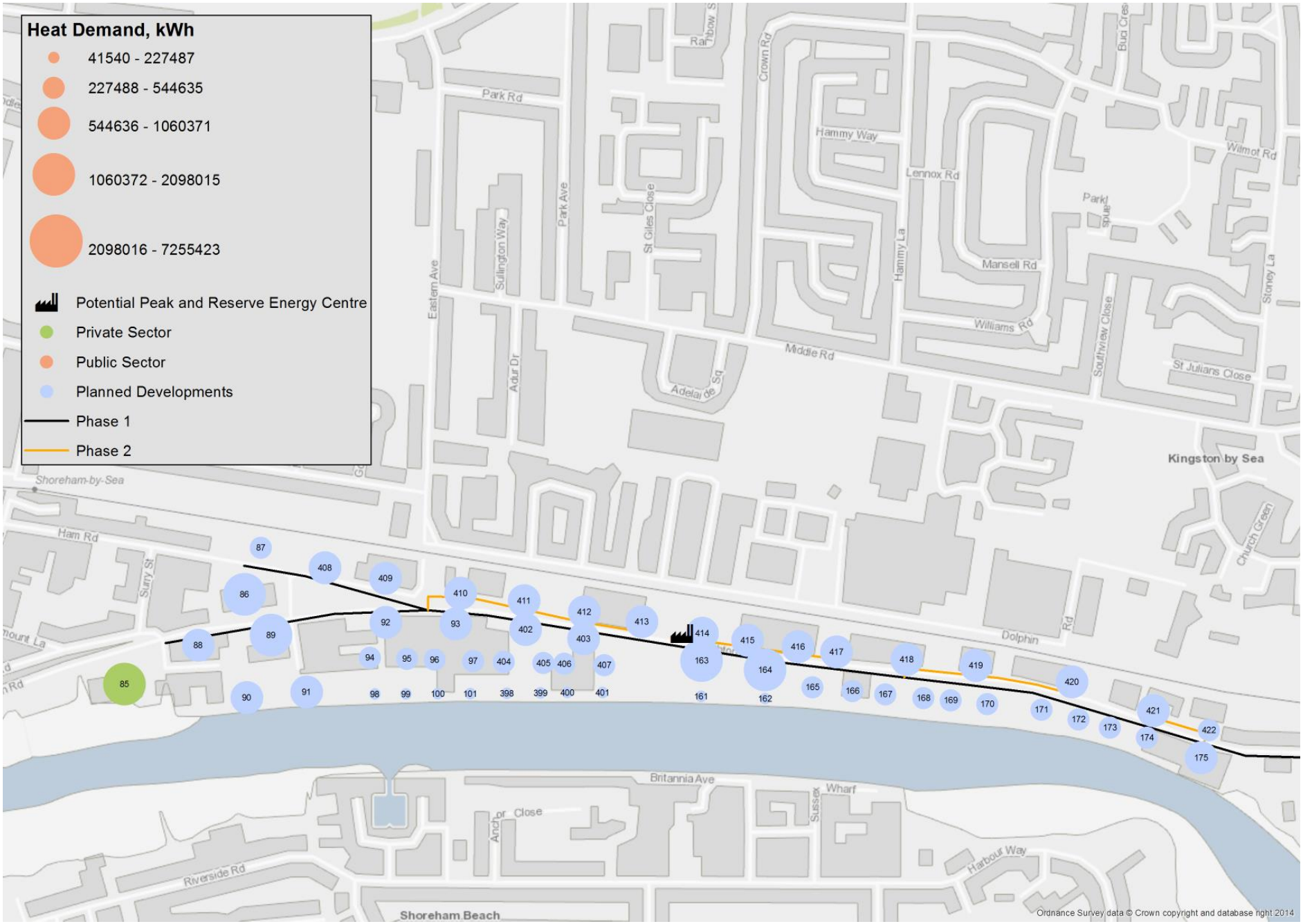


Figure 40: Western section of scenario B phase 2

Table 29: Building identifications for scenario B phase 2

Site ID	Building Name	Site ID	Building Name
85	79-81 Brighton Road, Parcelforce site	248	Southwick Library
86	Adur Civic Centre	249	Southwick Community Association
87	Adur Civic Centre Car Park	250	Eastbrook Primary Academy (North site)
88	Western Harbour Arm Flats 1	251	Leisure Centre
89	Western Harbour Arm Flats 2	252	Indoor Bowling Club
90	Western Harbour Arm Flats 3	256	Land Adjacent to Eastbrook Academy
91	Western Harbour Arm Flats 4	261	Nyenex House
92	Western Harbour Arm Flats 5	262	Stepping Stones Children Family Centre, Council Health Centre
93	Western Harbour Arm Flats 6	263	Community Centre Fishergate
94	Western Harbour Arm Housing 1	264	Eastbrook Primary Academy (South Site)
95	Western Harbour Arm Housing 2	265	Westlands Court, building 1
96	Western Harbour Arm Housing 3	266	Westlands Court, building 2
97	Western Harbour Arm Housing 4	267	Westlands Court, building 3
98	Western Harbour Arm Employment 1	268	5-8 Laylands road
99	Western Harbour Arm Employment 2	269	Wyck Court, building 1
100	Western Harbour Arm Employment 3	270	Wyck Court, building 2
101	Western Harbour Arm Employment 4	271	Laylands Court, building 1
161	Western Harbour Arm Employment 9	272	Laylands Court, building 2
162	Western Harbour Arm Employment 10	273	Laylands Court, building 3
163	Western Harbour Arm Flats 9	274	Laylands Court, building 4
164	Western Harbour Arm Flats 10	275	Old Mill Close, building 1
165	Western Harbour Arm Flats 11	276	Old Mill Close, building 2
166	Western Harbour Arm Flats 12	277	Old Mill Close, building 3
167	Western Harbour Arm Flats 13	278	Old Mill Close, building 4
168	Western Harbour Arm Flats 14	279	Summer Close
169	Western Harbour Arm Flats 15	280	Big Box Self Storage
170	Western Harbour Arm Flats 16	281	Tungsten Buildings, 12 units
171	Western Harbour Arm Flats 17	282	Greg Stone, flooring
172	Western Harbour Arm Flats 18	283	R&D Goatley Ltd
173	Western Harbour Arm Flats 19	284	Kew Electrical
174	Western Harbour Arm Flats 20	285	Chapel Road, Warehouse units
175	Western Harbour Arm Flats 21	286	Johnsons Apparel Master
219	Dudman Aggregate	287	Mill Road Industrial Estate
220	Grange Industrial Estate, Coppard plant hire	288	Adams Packaging
221	Grange Industrial Estate, Southover Food Company	289	Southdown Construction Ltd, Fishergate Forge
222	Grange Industrial Estate, The Tile Source, Showroom	290	The Adenstar Group offices
223	Grange Industrial Estate, Eyre & Elliston, Electrical Distributors	398	WHA Stage 2 Employment 5
224	Grange Industrial Estate, Wemoto, motorcycle parts	399	WHA Stage 2 Employment 6
225	Grange Industrial Estate, Optimum Kitchen Appliance Centre	400	WHA Stage 2 Employment 7
226	Wyndeham Grange, Printers	401	WHA Stage 2 Employment 8
227	Wyndeham Grange, Offices	402	WHA Stage 2 Flats 7
228	Locks Court	403	WHA Stage 2 Flats 8
229	Grange Court	404	WHA Stage 2 Housing 5
230	Coates Court, building 1	405	WHA Stage 2 Housing 6
231	Coates Court, building 2	406	WHA Stage 2 Housing 7
232	Coates Court, building 3	407	WHA Stage 2 Housing 8
233	Watling Court, building 2	408	WHA Stage 3 Flats 1
234	Watling Court, building 1	409	WHA Stage 3 Flats 2
235	Spring Gardens	410	WHA Stage 3 Flats 3
236	Rock Close, building 2	411	WHA Stage 3 Flats 4
237	Rock Close, building 1	412	WHA Stage 3 Flats 5
238	Channel View	413	WHA Stage 3 Flats 6
239	Sea House	414	WHA Stage 3 Flats 7

Site ID	Building Name	Site ID	Building Name
240	Harbour Court	415	WHA Stage 3 Flats 8
241	Albion House	416	WHA Stage 3 Flats 9
242	Dudman Offices	417	WHA Stage 3 Flats 10
243	Nautilus House, Port Authority Offices	418	WHA Stage 3 Flats 11
244	Southwick Waterfront, Lady Bee Marina	419	WHA Stage 3 Flats 12
245	Old Town Hall	420	WHA Stage 3 Flats 13
246	PB Law solicitors	421	WHA Stage 3 Flats 14
247	Doctors Surgery, Manor Practise	422	WHA Stage 3 Flats 15

Heat Demand Categories

Figure 41 categorises the nature and ownership of key heat loads within the network based on the total heat demand. 74% of the heat demand is from planned developments and 65% arises from private residential use.

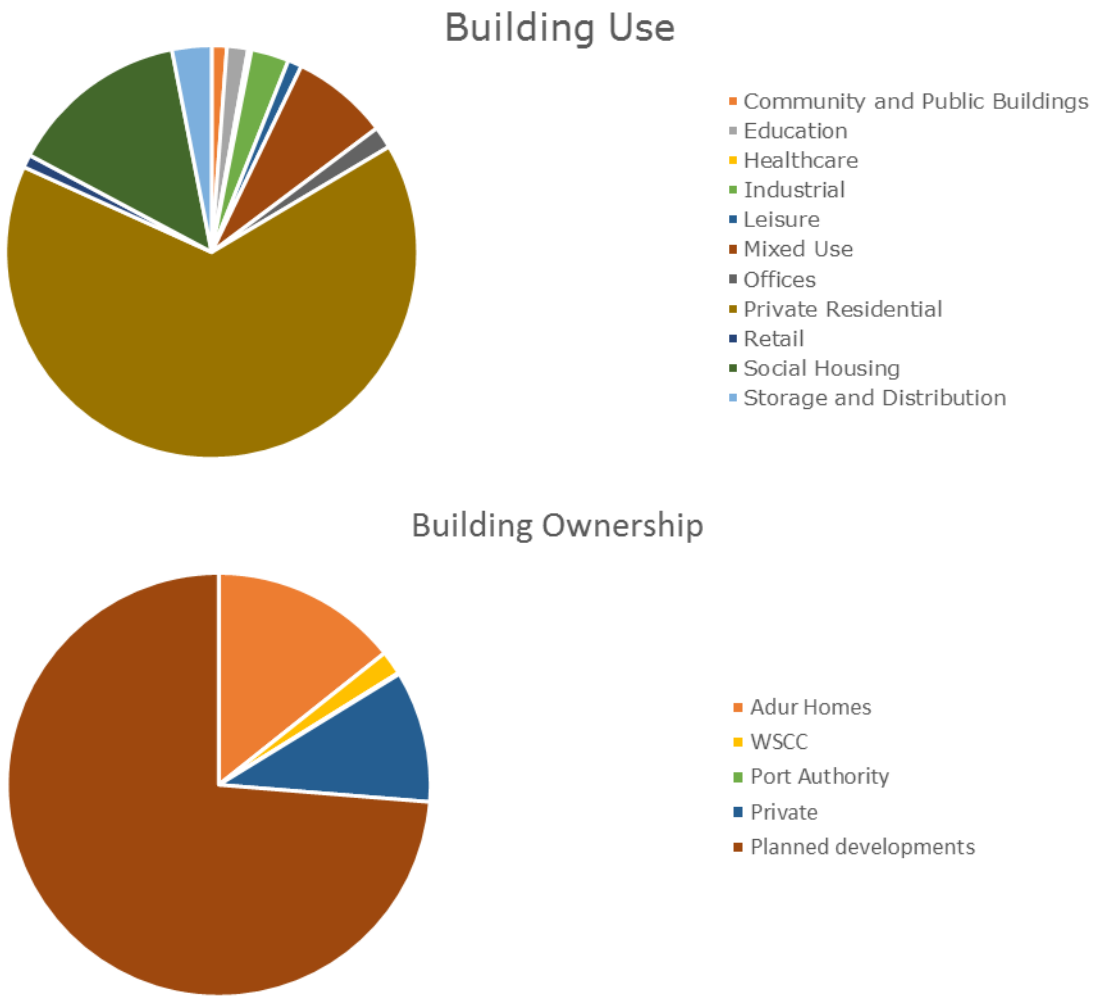


Figure 41: Scenario B phase 2 building use and ownership heat demand categories

Hourly Heat Demand Profile

The heat losses for phase 2 of the network were calculated as 3,595MW and added onto the total heat demand profile. These losses equate to 7% of the total network demand. The hourly heat demand profile showing the average, maximum and minimum heat demands for the network is shown in Figure 42. The peak heat demand is approximately 21MW and occurs at 8am. Daily profiles for a winter and summer month are shown in Appendix 4 – Heat Demand Modelling.

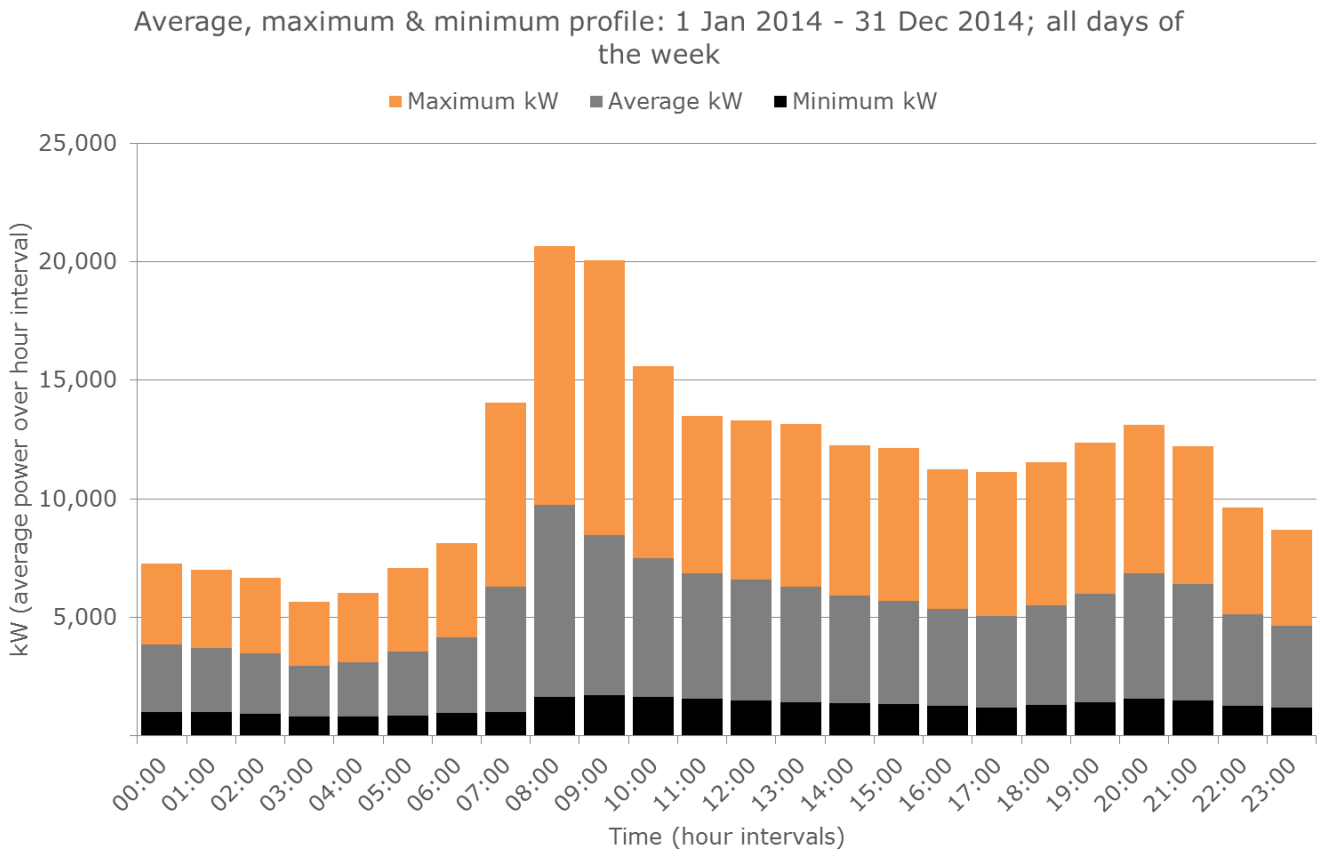


Figure 42: Scenario B phase 2 average daily heat demand

Technology Appraisal
The results from the technology appraisal for the phase 2 network are shown in Table 30 (with other less viable options assessed included in Appendix 6 – Financial Viability Assessments).

Table 30: Scenario B phase 2 technology appraisal

Technology		Gas CHP	Biofuel CHP
Heat output		9 MW	20 MW
% heat supplied by technology		94%	95%
% heat supplied by peak and reserve		6%	5%
Electrical output		6.3 MW	-
Capital expenditure	**Technology costs**	£6,940,800	£1,816,500
	Network costs	£8,857,377	£8,039,677
	Total	£15,798,177	£9,856,177
IRR		5%	13%
Net present value		£2,809,033	£14,855,413
Payback		16 years	8 years
25 year income		£29,492,053	£39,167,372
Carbon savings		10,724 tonnes	10,042 tonnes

Gas CHP
Table 31 summarises the impact of private wire arrangements on the high level financial case for gas CHP.

Table 31: Private wire for gas CHP

Private wire		Base[45]	100% private wire[46]	0% private wire[47]
Heat output		9 MW		
Electricity output		6.3 MW		
Capital costs	**Technology costs**	£6,940,800	£6,940,800	£6,940,800
	Network costs	£8,857,377	£8,857,377	£8,039,677
	Total	£15,798,177	£15,798,177	£14,980,477
IRR		5%	6%	1%
NPV		£2,809,033	£5,814,802	-£4,173,081
Payback		16 years	14 years	23 years
25 year income		£29,492,053	£34,256,136	£17,129,505

If private wire agreements for the gas CHP option cannot be secured then the network is unviable. This option assumes that there are private wire agreements to provide electricity to the end users associated with the phase 1b energy network (and this is reflected in the capital costs). There are very high associated connection risks and as there is, at best, marginal financial viability associated with securing agreements to serve 100% of the phase 1b energy network, therefore this option is deemed unviable.

Biofuel CHP
As in phase 1b, the most viable financial case for this network option is achieved with the purchase of heat from a biofuel CHP plant. The 25 and 40 year high level financial cases for this option are shown in Table 32.

Table 32: 25 and 40 year high level financial cases for biofuel CHP

Financial case period		25 years	40 years
Heat output		20 MW	
Electricity output		N/A	
Capital expenditure	**Technology costs**	£1,816,500	
	Network costs	£8,039,677	
	Total	£9,856,177	
IRR		13%	14%
Net present value		£14,855,413	£26,159,409
Payback		8 years	9 years
Total income		£39,167,372	£75,430,090
Carbon saving		10,042 tonnes	

Energy Centre
The proposed location for the plant / power station is likely to be able to accommodate a 20MW plant but, as stated, if the site footprint is deemed inadequate then feedstocks such as wood fuel can be stored at another location and transported to the plant via either a large overhead conveyor or delivery vehicle.

[45] Assumes 80% of electricity is exported to grid.
[46] Assumes 100% of electricity demand of the phase 1b energy network is met by private wire and 72% of electricity generated by gas CHP scheme is exported to grid. Due to scale and risk the private wire network has been extended beyond those buildings receiving energy as part of the Phase 1b network.
[47] Assumes 100% of electricity generated by gas CHP scheme is exported to grid.

The peak and reserve energy centre for this network phase will require a land area of 727m^2. This land area does not consider significant further expansion of the network and, as outlined in scenario A, there may be more than one location for peak and reserve boilers (see 3.3.3).

Timescale
This phase is reliant on stages 2 and 3 of the Western Harbour Arm development being built out and connecting to the existing network. The planned developments in stage 2 are due within the next 10 years and stage 3 planned developments due within the next 15-20 years, therefore this network has a potential delivery date of 2035.

Key Network Risks and Considerations
Due to the nature of the site, the only potentially viable source of low cost and low carbon heat for a network of this size is biofuel CHP. As this phase is reliant on stages 2 and 3 of Western Harbour Arm, effective early engagement with the developers is essential. The approach to engaging with developers is discussed in chapter 5.

The main network risks are similar to phase 1b and include the development of a biofuel CHP plant/power station, connection risk, accessing the tunnel to take heat beneath the canal, crossing the railway line, the potential transport disruption caused by developing the network and locating the plant / power station and energy centre in a space confined area (the plant will need to be larger to serve this network and so this risk is increased).

As the majority of potential heat demand comes from the private sector (mainly residential buildings) and 74% from planned developments, connection risk will be very high. The developments along the Western Harbour Arm are key to viability and if they do not connect to the financial case for the network will be severely diminished.

This network option is further investigated and high level financial case sensitivity and risk is further assessed in Chapter 4.

3.3.5 Scenario B, Phase 3

The Network

The phase 3 of the network is shown in Figure 43 and a summary of the network is provided in Table 33. The network is developed from phase 2 to include existing buildings including ADC offices at Pond Road, Dolphin Road Industrial Estate, South Portslade and Aldrington Basin.

Table 33: Scenario B, Phase 3 network summary

No. heat loads	Trench length	Total heat demand	Peak heat demand	Heat losses	Key heat loads	Date
215	13.0 km	71,699 MWh	25 MW	9%	- 79-81 Brighton Road - Western Harbour Arm Flats 1, 2, 9, 10 planned developments - Adur Civic Centre redevelopment - Western Harbour Arm (phase 3) flats 7 & 10 - South Portslade residential development 1.1	2035

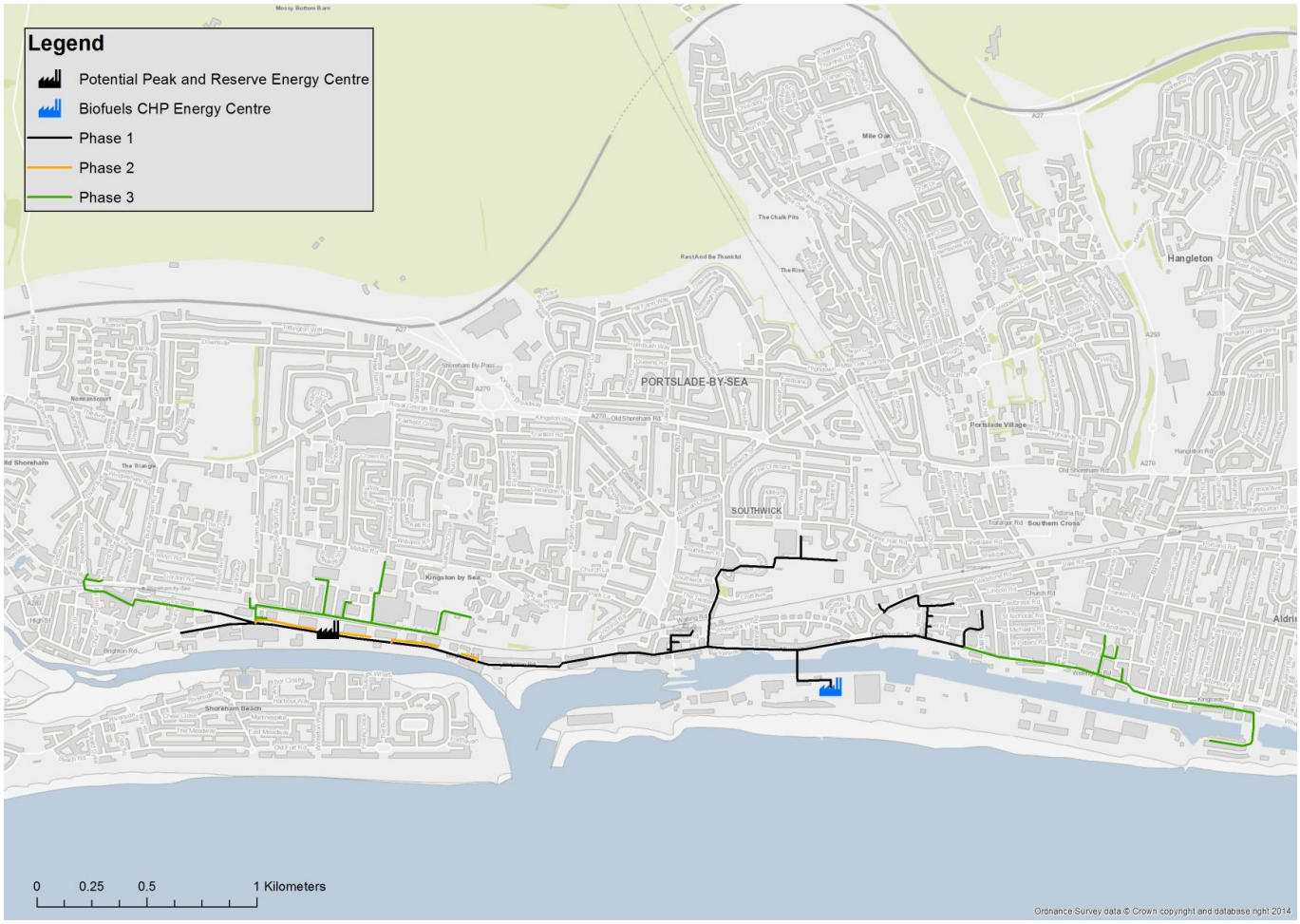


Figure 43: Scenario B phase 3 pipe route and energy centre locations

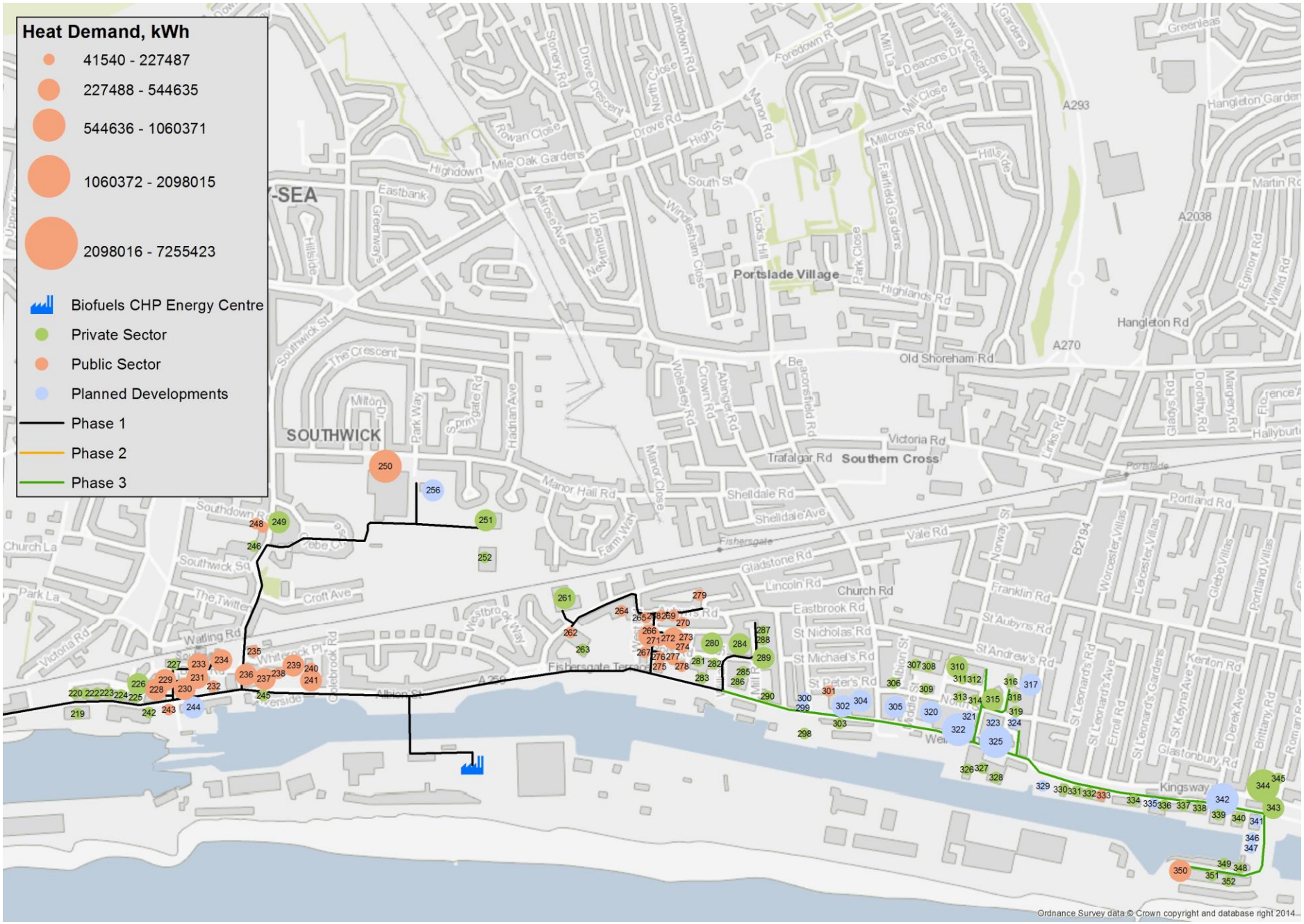


Figure 44: Eastern section of scenario B phase 3

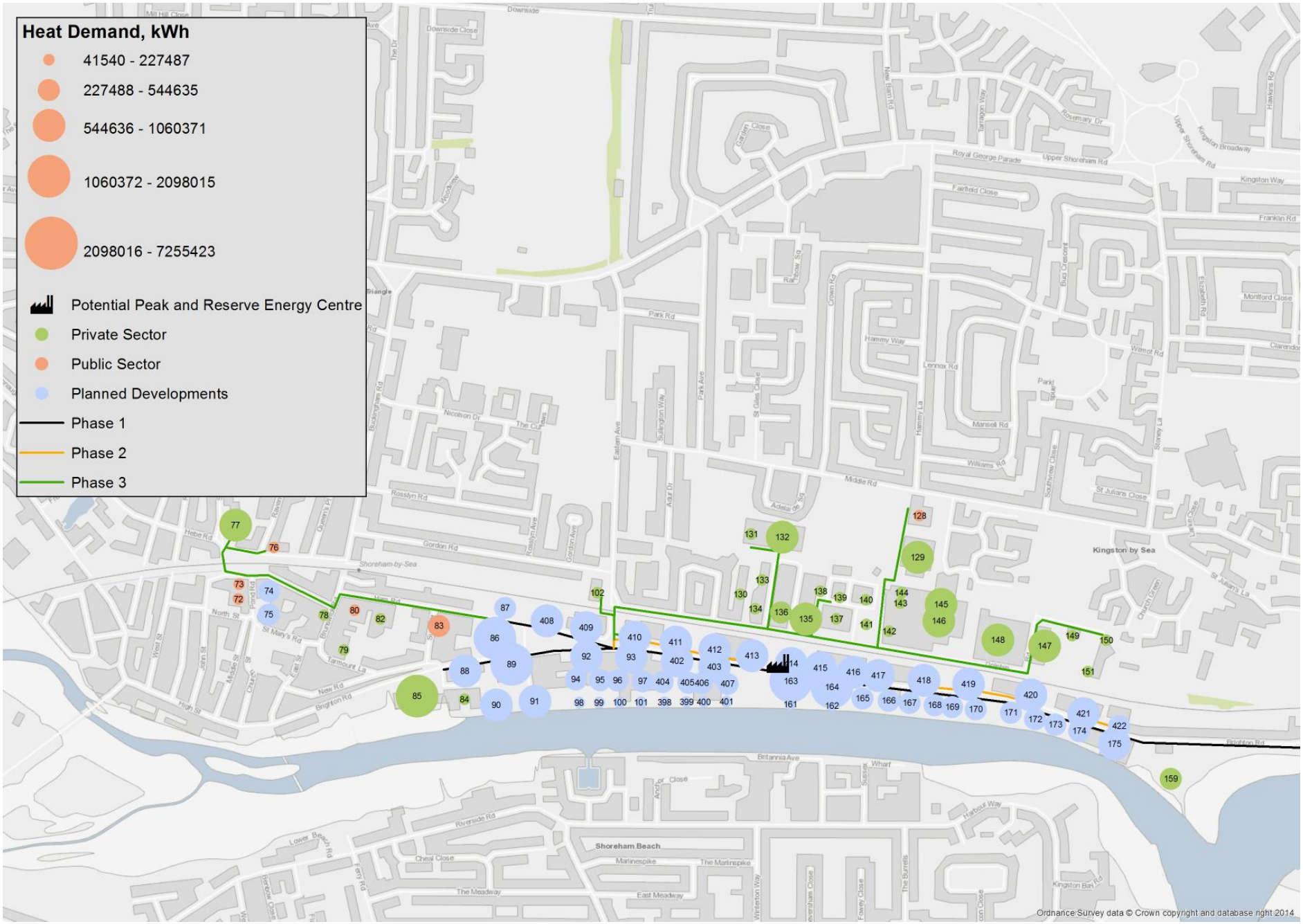


Figure 45: Western section of scenario B phase 3

Table 34: Building identifications for scenario B phase 3

Site ID	Building Name	Site ID	Building Name
72	Shoreham Centre, Community Centre	264	Eastbrook Primary Academy (South Site)
73	Shoreham Centre, Council Offices	265	Westlands Court, building 1
74	Pond Road, Community Building	266	Westlands Court, building 2
75	Pond Road, Residential	267	Westlands Court, building 3
76	Cecil Norris House	268	5-8 Laylands road
77	St Paul's Lodge	269	Wyck Court, building 1
78	Royal Mail Delivery Office	270	Wyck Court, building 2
79	Tarmount Lane, telephone exchange	271	Laylands Court, building 1
80	Police Station	272	Laylands Court, building 2
82	Coop, Ham Road	273	Laylands Court, building 3
83	Pashley Court	274	Laylands Court, building 4
84	Riverside Business Centre, 12 units	275	Old Mill Close, building 1
85	79-81 Brighton Road, Parcelforce site	276	Old Mill Close, building 2
86	Adur Civic Centre	277	Old Mill Close, building 3
87	Adur Civic Centre Car Park	278	Old Mill Close, building 4
88	Western Harbour Arm Flats 1	279	Summer Close
89	Western Harbour Arm Flats 2	280	Big Box Self Storage
90	Western Harbour Arm Flats 3	281	Tungsten Buildings, 12 units
91	Western Harbour Arm Flats 4	282	Greg Stone, flooring
92	Western Harbour Arm Flats 5	283	R&D Goatley Ltd
93	Western Harbour Arm Flats 6	284	Kew Electrical
94	Western Harbour Arm Housing 1	285	Chapel Road, Warehouse units
95	Western Harbour Arm Housing 2	286	Johnsons Apparel Master
96	Western Harbour Arm Housing 3	287	Mill Road Industrial Estate
97	Western Harbour Arm Housing 4	288	Adams Packaging
98	Western Harbour Arm Employment 1	289	Southdown Construction Ltd, Fishergate Forge
99	Western Harbour Arm Employment 2	290	The Adenstar Group offices
100	Western Harbour Arm Employment 3	298	Cemex
101	Western Harbour Arm Employment 4	299	South Portslade, residential 5.1
102	Palace Drinks	300	South Portslade, residential houses next to 5.1
128	Glebelands Day Hospital	301	St Peter's Community Primary School
129	Kingsland House Care Home	302	South Portslade, residential 4.1
130	Warehouse, 13 Dolphin Road	303	CP Mechanical Designs Limited
131	Warehouse behind 13 Dolphin Road	304	South Portslade Industrial Redevelopment, A
132	To let, previously PaperLinx	305	South Portslade Industrial Redevelopment, B
133	5 Industrial Units, Dolphin Way	306	London & Brighton Plating
134	House of Hugo	307	Jewson
135	Gemini Press Printers	308	Jewsons Warehouse
136	Gemini Press Warehouse	309	Offices, 2 North Street
137	Dolphin Enterprise Centre, formerly Edwards	310	Eurovans Brighton
138	Dolphin Enterprise Centre, D, 4 units	311	D W Electrical
139	Dolphin Enterprise Centre, C, 8 units	312	Iveco
140	Dolphin Enterprise Centre, B, 8 units	313	Unknown Offices, North Street
141	Edgars, Dolphin Enterprise Centre, A, 4 units	314	Display House
142	DAF	315	City Coast Church
143	Unknown Warehouse, behind DAF	316	Offices, East Street
144	Hall Business Centre	317	South Portslade, residential 2.1
145	Infinity Foods Coop	318	Warehouse, East Street
146	VW Heritage	319	Offices, North Street
147	Higgidy	320	South Portslade Industrial Redevelopment, C 1
148	Pyroban	321	South Portslade Industrial Redevelopment, C 2
149	G3 Business Park, Units 11-12	322	South Portslade, residential 3.1

Site ID	Building Name	Site ID	Building Name
150	G3 Business Park, Units 1-7	323	South Portslade Industrial Redevelopment, D
151	G3 Business Park, Units 8-10	324	South Portslade, residential 1.2
159	RNLI Lifeboat station	325	South Portslade, residential 1.1
161	Western Harbour Arm Employment 9	326	Travis Perkins 1
162	Western Harbour Arm Employment 10	327	Travis Perkins 2
163	Western Harbour Arm Flats 9	328	Travis Perkins 3
164	Western Harbour Arm Flats 10	329	Aldrington Basin Warehouses, Plot 3.1
165	Western Harbour Arm Flats 11	330	Hove Enterprise Centre 1
166	Western Harbour Arm Flats 12	331	Hove Enterprise Centre 2
167	Western Harbour Arm Flats 13	332	Hove Enterprise Centre 3
168	Western Harbour Arm Flats 14	333	Waterside House, Hove Enterprise Centre 4
169	Western Harbour Arm Flats 15	334	Hove Enterprise Centre 5, Units 1-9
170	Western Harbour Arm Flats 16	335	Aldrington Basin Warehouses, Plot 4.1
171	Western Harbour Arm Flats 17	336	Maritime House
172	Western Harbour Arm Flats 18	337	Warehouse East of Maritime House
173	Western Harbour Arm Flats 19	338	Basin Road North, Warehouse 1
174	Western Harbour Arm Flats 20	339	Beachwood Timber 1
175	Western Harbour Arm Flats 21	340	Beachwood Timber 2
219	Dudman Aggregate	341	Aldrington Basin Warehouses, Plot 5.1
220	Grange Industrial Estate, Coppard plant hire	342	Aldrington Basin, PortZED Development
221	Grange Industrial Estate, Southover Food Company	343	Blue Lagoon Bar
222	Grange Industrial Estate, The Tile Source, Showroom	344	Vega
223	Grange Industrial Estate, Eyre & Elliston, Electrical Distributors	345	Offices behind Vega
224	Grange Industrial Estate, Wemoto, motorcycle parts	346	Aldrington Basin Warehouses, Plot 2.1
225	Grange Industrial Estate, Optimum Kitchen Appliance Centre	347	Aldrington Basin Warehouses, Plot 2.2
226	Wyndeham Grange, Printers	348	B & N Fish Sales 2
227	Wyndeham Grange, Offices	349	B & N Fish Sales 1
228	Locks Court	350	Quayside House
229	Grange Court	351	Basin Road South, Offices 1
230	Coates Court, building 1	352	Basin Road South, Offices 2
231	Coates Court, building 2	398	WHA Stage 2 Employment 5
232	Coates Court, building 3	399	WHA Stage 2 Employment 6
233	Watling Court, building 2	400	WHA Stage 2 Employment 7
234	Watling Court, building 1	401	WHA Stage 2 Employment 8
235	Spring Gardens	402	WHA Stage 2 Flats 7
236	Rock Close, building 2	403	WHA Stage 2 Flats 8
237	Rock Close, building 1	404	WHA Stage 2 Housing 5
238	Channel View	405	WHA Stage 2 Housing 6
239	Sea House	406	WHA Stage 2 Housing 7
240	Harbour Court	407	WHA Stage 2 Housing 8
241	Albion House	408	WHA Stage 3 Flats 1
242	Dudman Offices	409	WHA Stage 3 Flats 2
243	Nautilus House, Port Authority Offices	410	WHA Stage 3 Flats 3
244	Southwick Waterfront, Lady Bee Marina	411	WHA Stage 3 Flats 4
245	Old Town Hall	412	WHA Stage 3 Flats 5
246	PB Law solicitors	413	WHA Stage 3 Flats 6
247	Doctors Surgery, Manor Practise	414	WHA Stage 3 Flats 7
248	Southwick Library	415	WHA Stage 3 Flats 8
249	Southwick Community Association	416	WHA Stage 3 Flats 9
250	Eastbrook Primary Academy (North site)	417	WHA Stage 3 Flats 10
251	Leisure Centre	418	WHA Stage 3 Flats 11
252	Indoor Bowling Club	419	WHA Stage 3 Flats 12
256	Land Adjacent to Eastbrook Academy	420	WHA Stage 3 Flats 13
261	Nyenex House	421	WHA Stage 3 Flats 14

Site ID	Building Name	Site ID	Building Name
262	Stepping Stones Children Family Centre, Council Health Centre	422	WHA Stage 3 Flats 15
263	Community Centre Fishergate		

Heat Demand Categories

Figure 46 categorises the nature and ownership of key heat loads within the network based on the total heat demand. 62% of the heat demand is from planned developments with 51% arising from private residential use.

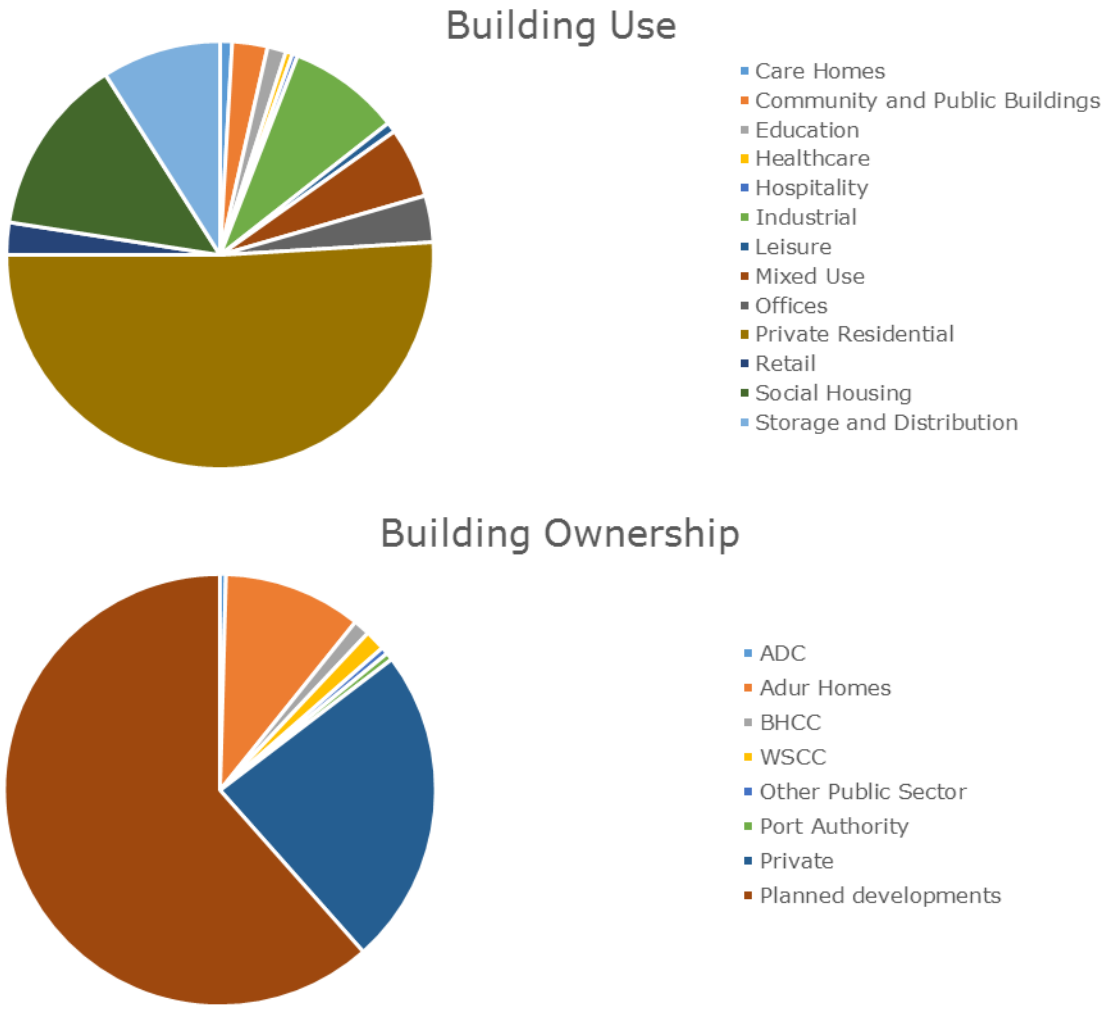


Figure 46: Scenario B phase 3 building use and ownership heat demand categories

Hourly Heat Demand Profile

The heat losses for phase 3 of the network were calculated as 6,656 MW and added onto the total heat demand profile. These losses equate to 9% of the total network demand. The hourly heat demand profile showing the average, maximum and minimum heat demands for the network is shown in Figure 47. The peak heat demand is approximately 30 MW and this occurs at 8am. Daily profiles for a winter and summer month are shown in Appendix 4 – Heat Demand Modelling.

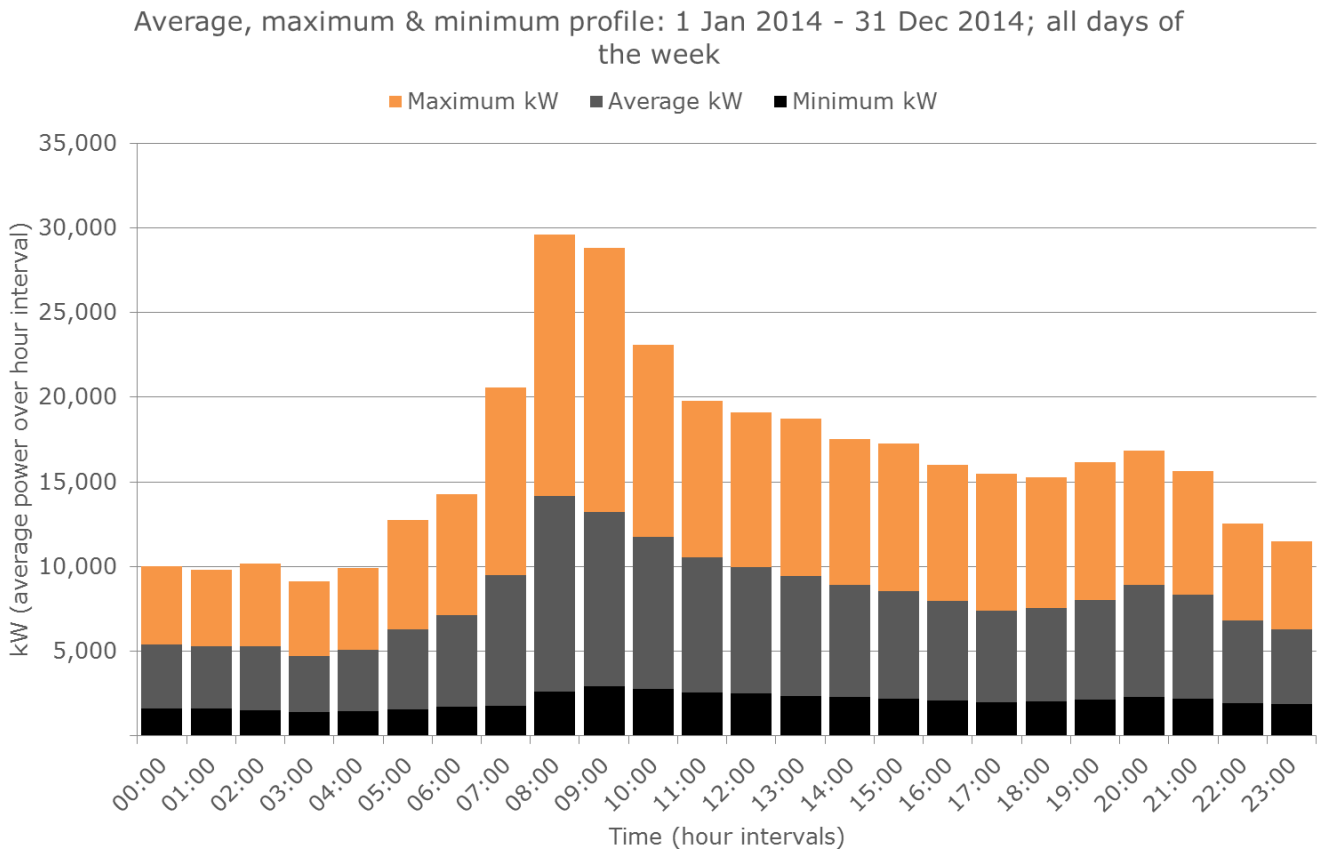


Figure 47: Scenario B phase 3 average daily heat demand

Technology Appraisal
The results from the technology appraisal for the phase 3 network are shown in Table 35 (with other less viable options assessed included in Appendix 6 – Financial Viability Assessments).

Table 35: Scenario B phase 3 technology appraisal

Technology		Biofuel CHP
Heat output		20 MW
% heat supplied by technology		94%
% heat supplied by peak and reserve		6%
Electrical output		N/A
Capital expenditure	**Technology costs**	£2,635,500
	Network costs	£14,717,385
	Total	£17,352,885
IRR		10%
Net present value		£17,617,009
Payback		10 years
25 year income		£55,426,578
Carbon savings		14,396 tonnes

Biofuel CHP
Biofuel CHP is deemed the only potentially viable heat source for a network of this scale (within the heat map area). The 25 and 40 year high level financial cases for this network option are summarised in Table 36.

Table 36: 25 and 40 year high level financial case for biofuel CHP

Financial case period		25 years	40 years
Heat output		20 MW	
Electricity output		N/A	
Capital expenditure	**Technology costs**	£2,635,500	
	Network costs	£14,717,385	
	Total	£17,352,885	
IRR		10%	11%
Net present value		£17,617,009	£33,596,533
Payback		10 years	10 years
Total income		£55,426,578	£106,707,115
Carbon saving		14,396 tonnes	

Energy Centre
As previously stated, the proposed location for the plant / power station is likely to be able to accommodate a 20MW plant and if the site footprint is deemed too small then feedstocks such as woodfuel can be stored at a nearby location. The peak and reserve energy centre for this network phase will require a land area of 1,054m^2 and this could be located at the previously discussed sites. This land area does not consider significant further expansion of the network.

Timescale
This phase could be developed by 2035 (within the same timescale as phase 2) and is also reliant upon stages 2 and 3 of the Western Harbour Arm planned development[48].

Key Network Risks and Considerations
The main network risks include the development of a biofuel CHP plant/power station, connection risk, accessing the tunnel to take heat beneath the canal, crossing the railway line, the potential transport disruption caused by developing the network and locating the plant / power station and energy centre in a space confined area (the plant will need to be larger to serve this network and so this risk is increased).

As the majority of potential heat demand comes from the private sector (mainly residential buildings) and 62% from planned developments, connection risk will be very high. The developments along the Western Harbour Arm are key to viability and if they do not connect to the financial case for the network will be severely diminished.

This network option is further investigated and high level financial case sensitivity and risk is further assessed in Chapter 4.

[48] If this network was built before or without the Western Harbour Arm stage 2 and 3 planned developments then it would be the same as scenario A phase 1.

3.3.6 Scenario B, Phase 4

The Network

Phase 4 of the network is shown in Figure 48 and a summary of the network is provided in Table 37. This network follows the same route as scenario A phase 2 and expands on the scenario B phase 3 network to include the existing buildings of Swiss Gardens Primary School and social housing to the west, Shoreham College, Shoreham Academy, Wilmot Road social housing and Southlands Hospital to the north and EDF offices and nearby social housing to the east. The network also includes the planned developments of Ropetackle north to the west and King Alfred Leisure Centre to the east.

Table 37: Scenario B, Phase 4 network summary

No. heat loads	Trench length	Total heat demand	Peak heat demand	Heat losses	% Heat supplied by biofuel CHP	% Heat supplied by peak & reserve	Key heat loads	Date
288	21km	106,975 MWh	36 MW	10%	91%	9%	- King Alfred Leisure Centre planned development - 79-81 Brighton Road - Southlands Hospital - Western Harbour Arm flats 2, 9 & 10 - Stevens Court - Shoreham Academy - Southland's Hospital residential development	2035

Figure 48: Scenario B phase 4 pipe route and energy centre locations

Figure 49: Eastern section of scenario B phase 4

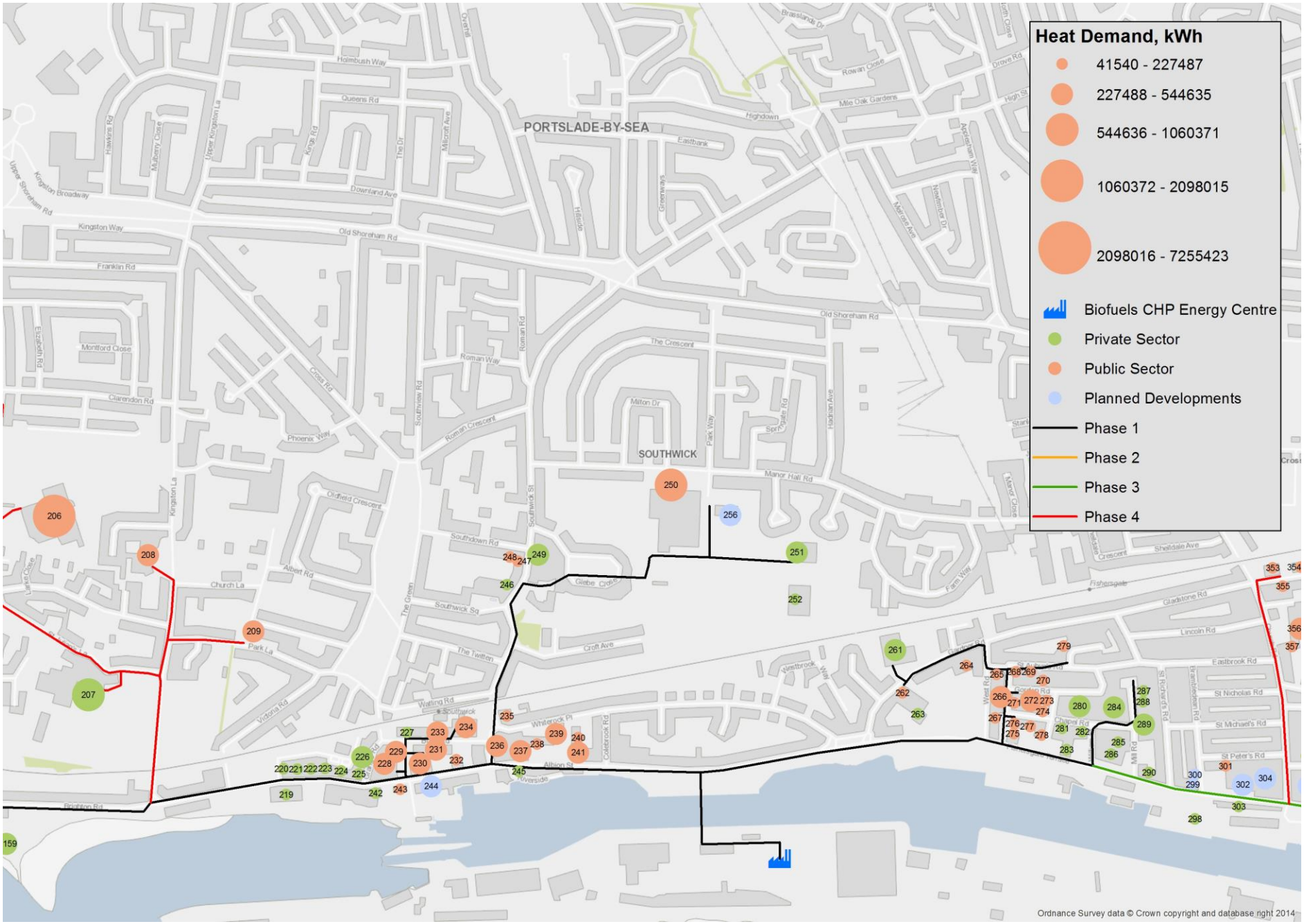


Figure 50: Central section of scenario B phase 4

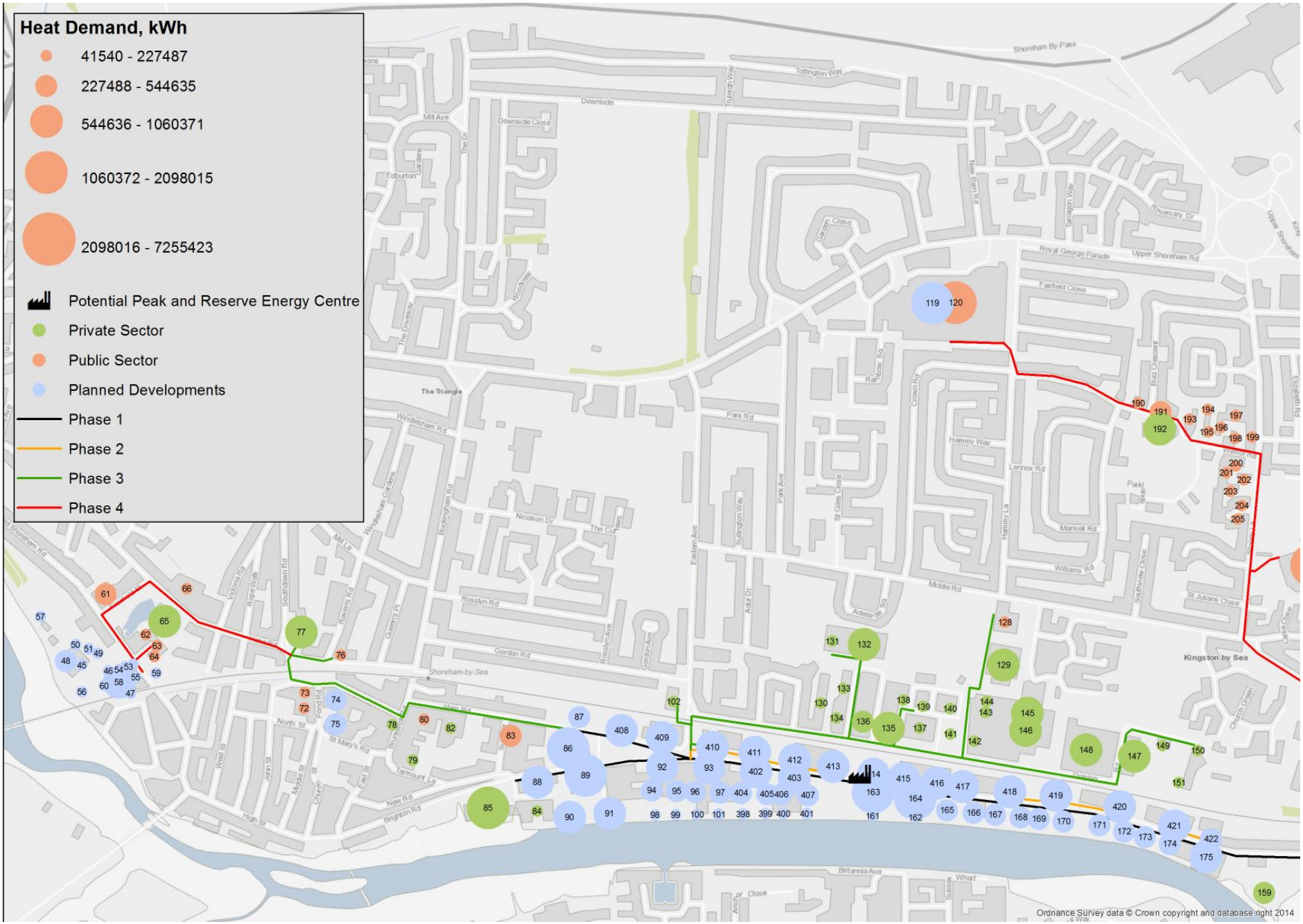


Figure 51: Western section of scenario B phase 4

Table 38: Building identifications for scenario B phase 4

Site ID	Building Name	Site ID	Building Name
45	Ropetackle North, 12x House Type 3	249	Southwick Community Association
46	Ropetackle North, 14x House Type 2	250	Eastbrook Primary Academy (North site)
47	Ropetackle North, 18x railway arches	251	Leisure Centre
48	Ropetackle North, 23x House Type 1	252	Indoor Bowling Club
49	Ropetackle North, 2x Mews House Type 1	256	Land Adjacent to Eastbrook Academy
50	Ropetackle North, 3x House Type 4	261	Nyenex House
51	Ropetackle North, 5x Mews House Type 2	262	Stepping Stones Children Family Centre, Council Health Centre
52	Ropetackle North, Block A1	263	Community Centre Fishergate
53	Ropetackle North, Block A2	264	Eastbrook Primary Academy (South Site)
54	Ropetackle North, Block A3	265	Westlands Court, building 1
55	Ropetackle North, Block B1	266	Westlands Court, building 2
56	Ropetackle North, Block C	267	Westlands Court, building 3
57	Ropetackle North, Block D	268	5-8 Laylands road
58	Ropetackle North, Block E	269	Wyck Court, building 1
59	Ropetackle North, Block F	270	Wyck Court, building 2
60	Ropetackle North, Block G	271	Laylands Court, building 1
61	Aston House	272	Laylands Court, building 2
62	Buckingham Street, building 1	273	Laylands Court, building 3
63	Buckingham Street, building 2	274	Laylands Court, building 4
64	Buckingham Street, building 3	275	Old Mill Close, building 1
65	Homehaven Court	276	Old Mill Close, building 2
66	Swiss Gardens Primary School	277	Old Mill Close, building 3
72	Shoreham Centre, Community Centre	278	Old Mill Close, building 4
73	Shoreham Centre, Council Offices	279	Summer Close
74	Pond Road, Community Building	280	Big Box Self Storage
75	Pond Road, Residential	281	Tungsten Buildings, 12 units
76	Cecil Norris House	282	Greg Stone, flooring
77	St Paul's Lodge	283	R&D Goatley Ltd
78	Royal Mail Delivery Office	284	Kew Electrical
79	Tarmount Lane, telephone exchange	285	Chapel Road, Warehouse units
80	Police Station	286	Johnsons Apparel Master
82	Coop, Ham Road	287	Mill Road Industrial Estate
83	Pashley Court	288	Adams Packaging
84	Riverside Business Centre, 12 units	289	Southdown Construction Ltd, Fishergate Forge
85	79-81 Brighton Road, Parcelforce site	290	The Adenstar Group offices
86	Adur Civic Centre	298	Cemex
87	Adur Civic Centre Car Park	299	South Portslade, residential 5.1
88	Western Harbour Arm Flats 1	300	South Portslade, residential houses next to 5.1
89	Western Harbour Arm Flats 2	301	St Peter's Community Primary School
90	Western Harbour Arm Flats 3	302	South Portslade, residential 4.1
91	Western Harbour Arm Flats 4	303	CP Mechanical Designs Limited
92	Western Harbour Arm Flats 5	304	South Portslade Industrial Redevelopment, A
93	Western Harbour Arm Flats 6	305	South Portslade Industrial Redevelopment, B
94	Western Harbour Arm Housing 1	306	London & Brighton Plating
95	Western Harbour Arm Housing 2	307	Jewson
96	Western Harbour Arm Housing 3	308	Jewsons Warehouse
97	Western Harbour Arm Housing 4	309	Offices, 2 North Street
98	Western Harbour Arm Employment 1	310	Eurovans Brighton
99	Western Harbour Arm Employment 2	311	D W Electrical
100	Western Harbour Arm Employment 3	312	Iveco
101	Western Harbour Arm Employment 4	313	Unknown Offices, North Street
102	Palace Drinks	314	Display House
119	Southlands Hospital Development	315	City Coast Church
120	Southlands Hospital	316	Offices, East Street

Site ID	Building Name	Site ID	Building Name
128	Glebelands Day Hospital	317	South Portslade, residential 2.1
129	Kingsland House Care Home	318	Warehouse, East Street
130	Warehouse, 13 Dolphin Road	319	Offices, North Street
131	Warehouse behind 13 Dolphin Road	320	South Portslade Industrial Redevelopment, C 1
132	To let, previously PaperLinx	321	South Portslade Industrial Redevelopment, C 2
133	5 Industrial Units, Dolphin Way	322	South Portslade, residential 3.1
134	House of Hugo	323	South Portslade Industrial Redevelopment, D
135	Gemini Press Printers	324	South Portslade, residential 1.2
136	Gemini Press Warehouse	325	South Portslade, residential 1.1
137	Dolphin Enterprise Centre, formerly Edwards	326	Travis Perkins 1
138	Dolphin Enterprise Centre, D, 4 units	327	Travis Perkins 2
139	Dolphin Enterprise Centre, C, 8 units	328	Travis Perkins 3
140	Dolphin Enterprise Centre, B, 8 units	329	Aldrington Basin Warehouses, Plot 3.1
141	Edgars, Dolphin Enterprise Centre, A, 4 units	330	Hove Enterprise Centre 1
142	DAF	331	Hove Enterprise Centre 2
143	Unknown Warehouse, behind DAF	332	Hove Enterprise Centre 3
144	Hall Business Centre	333	Waterside House, Hove Enterprise Centre 4
145	Infinity Foods Coop	334	Hove Enterprise Centre 5, Units 1-9
146	VW Heritage	335	Aldrington Basin Warehouses, Plot 4.1
147	Higgidy	336	Maritime House
148	Pyroban	337	Warehouse East of Maritime House
149	G3 Business Park, Units 11-12	338	Basin Road North, Warehouse 1
150	G3 Business Park, Units 1-7	339	Beachwood Timber 1
151	G3 Business Park, Units 8-10	340	Beachwood Timber 2
159	RNLI Lifeboat station	341	Aldrington Basin Warehouses, Plot 5.1
161	Western Harbour Arm Employment 9	342	Aldrington Basin, PortZED Development
162	Western Harbour Arm Employment 10	343	Blue Lagoon Bar
163	Western Harbour Arm Flats 9	344	Vega
164	Western Harbour Arm Flats 10	345	Offices behind Vega
165	Western Harbour Arm Flats 11	346	Aldrington Basin Warehouses, Plot 2.1
166	Western Harbour Arm Flats 12	347	Aldrington Basin Warehouses, Plot 2.2
167	Western Harbour Arm Flats 13	348	B & N Fish Sales 2
168	Western Harbour Arm Flats 14	349	B & N Fish Sales 1
169	Western Harbour Arm Flats 15	350	Quayside House
170	Western Harbour Arm Flats 16	351	Basin Road South, Offices 1
171	Western Harbour Arm Flats 17	352	Basin Road South, Offices 2
172	Western Harbour Arm Flats 18	353	Tozer Court
173	Western Harbour Arm Flats 19	354	Vale Court
174	Western Harbour Arm Flats 20	355	St Mary's Catholic Primary School
175	Western Harbour Arm Flats 21	356	Portslade Health Centre
190	Loney Court	357	Portslade Community Centre
191	Fraser Court	374	EDF Offices 1
192	Milward Court	375	EDF Offices 2
193	Penstone Court	376	EDF Offices 3
194	Julian Court	377	EDF Offices 4
195	Wilmot Court	378	EDF Offices 5
196	Osborne Court	379	Martello House, residential development
197	Holmbush Court	380	Portland Road Trading Estate
198	Downes Court	381	Portland Business Park Building 1
199	Adur Court	382	Portland Business Park Building 2
200	Broadway Court	383	Portland Business Park Building 3
201	Wiston Court	384	Wish Court, flats 1-23
202	Arun Court	385	Wish Court, flats 24-32
203	Arundel Court	386	Muriel House

Site ID	Building Name	Site ID	Building Name
204	Caius Court	387	Sanders House
205	Kingston Court	388	Jordan Court
206	Shoreham Academy	389	Knoll House
207	Shoreham College	390	Stevens Court
208	Ashcroft Sheltered Housing	391	Benson Court
209	Marsh House	392	Mountbatten Court
219	Dudman Aggregate	393	Lovegrove Court, flats 1-28
220	Grange Industrial Estate, Coppard plant hire	394	Lovegrove Court, flats 29-54
221	Grange Industrial Estate, Southover Food Company	395	Ingram Court
222	Grange Industrial Estate, The Tile Source, Showroom	396	Ingram Court, flats 1-38
223	Grange Industrial Estate, Eyre & Elliston, Electrical Distributors	397	King Alfred Development
224	Grange Industrial Estate, Wemoto, motorcycle parts	398	Western Harbour Arm Employment 5
225	Grange Industrial Estate, Optimum Kitchen Appliance Centre	399	Western Harbour Arm Employment 6
226	Wyndeham Grange, Printers	400	Western Harbour Arm Employment 7
227	Wyndeham Grange, Offices	401	Western Harbour Arm Employment 8
228	Locks Court	402	Western Harbour Arm Flats 7
229	Grange Court	403	Western Harbour Arm Flats 8
230	Coates Court, building 1	404	Western Harbour Arm Housing 5
231	Coates Court, building 2	405	Western Harbour Arm Housing 6
232	Coates Court, building 3	406	Western Harbour Arm Housing 7
233	Watling Court, building 2	407	Western Harbour Arm Housing 8
234	Watling Court, building 1	408	WHA Phase 3 Flats 1
235	Spring Gardens	409	WHA Phase 3 Flats 2
236	Rock Close, building 2	410	WHA Phase 3 Flats 3
237	Rock Close, building 1	411	WHA Phase 3 Flats 4
238	Channel View	412	WHA Phase 3 Flats 5
239	Sea House	413	WHA Phase 3 Flats 6
240	Harbour Court	414	WHA Phase 3 Flats 7
241	Albion House	415	WHA Phase 3 Flats 8
242	Dudman Offices	416	WHA Phase 3 Flats 9
243	Nautilus House, Port Authority Offices	417	WHA Phase 3 Flats 10
244	Southwick Waterfront, Lady Bee Marina	418	WHA Phase 3 Flats 11
245	Old Town Hall	419	WHA Phase 3 Flats 12
246	PB Law solicitors	420	WHA Phase 3 Flats 13
247	Doctors Surgery, Manor Practise	421	WHA Phase 3 Flats 14
248	Southwick Library	422	WHA Phase 3 Flats 15

Heat Demand Categories

Figure 52 categorises the nature and ownership of key heat loads within the network based on the total heat demand. 53% of the heat demand is from planned developments with 37% from private residential and 23% arising from social housing.

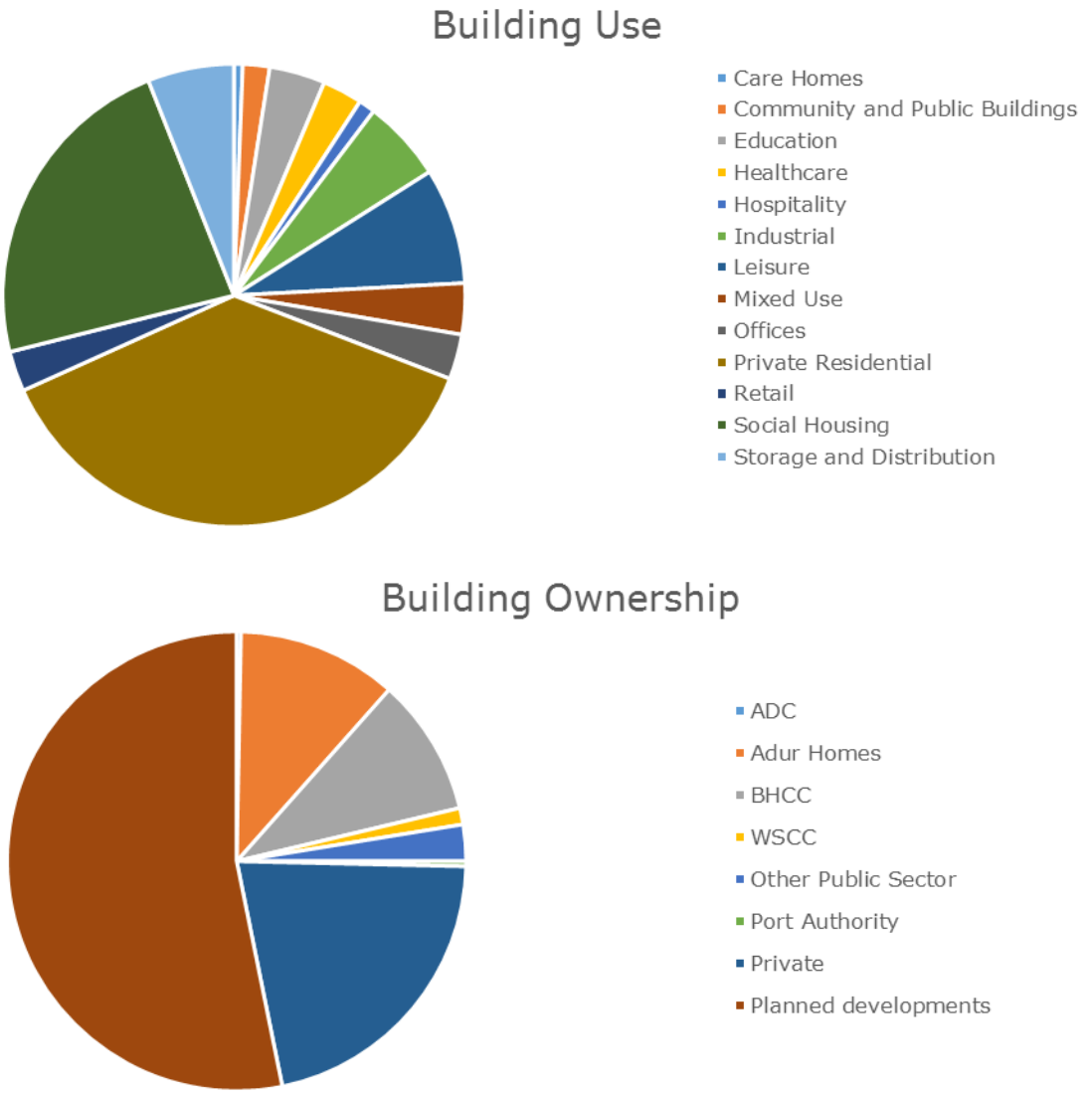


Figure 52: Scenario B phase 4 building use and ownership heat demand categories

Hourly Heat Demand Profile

The heat losses for phase 4 of the network were calculated as 10,450 MW and added onto the total heat demand profile. These losses equate to 10% of the total network demand. The hourly heat demand profile showing the average, maximum and minimum heat demands for the network is shown in Figure 53. The peak heat demand is approximately 43 MW and occurs at 8am. Daily profiles for a winter and summer month are shown in Appendix 4 – Heat Demand Modelling.

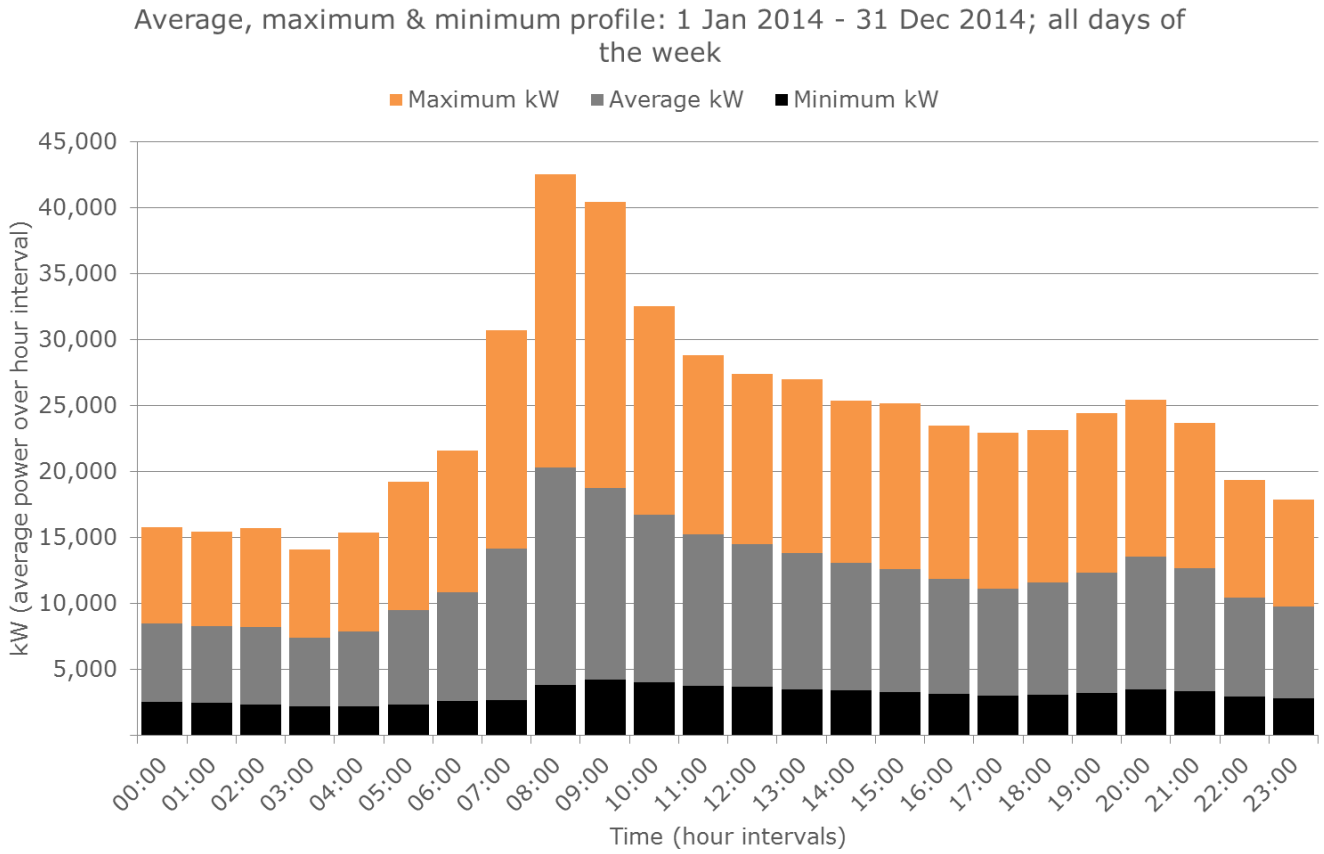


Figure 53: Scenario B phase 4 average daily heat demand

Technology Appraisal
The results from the technology appraisal for the phase 4 network are shown in Table 39 (with other less viable options assessed included in Appendix 6 – Financial Viability Assessments).

Table 39: Scenario B phase 4 technology appraisal

Technology		Biofuel CHP
Heat output		20 MW
% heat supplied by technology		91%
% heat supplied by peak and reserve		9%
Electrical output		N/A
Capital expenditure	**Technology costs**	£3,790,500
	Network costs	£22,955,717
	Total	£26,746,217
IRR		9%
Net present value		£23,032,923
Payback		11 years
25 year income		£78,898,935
Carbon savings		20,548 tonnes

Biofuel CHP is deemed the only potentially viable heat source for a network of this scale (within the heat map area). The 25 and 40 year high level financial cases for this network option are summarised in Table 40.

Table 40: 25 and 40 year high level financial cases for biofuel CHP

Financial case period		25 years	40 years
Heat output		20 MW	
Electricity output		-	
Capital expenditure	**Technology costs**	£3,790,500	
	Network costs	£22,955,717	
	Total	£26,746,217	
IRR		9%	11%
Net present value		£23,032,923	£45,760,764
Payback		11 years	11 years
Total income		£78,898,935	£151,856,705
Carbon saving		20,548 tonnes	

Energy Centre
The peak and reserve energy centre for this network phase will require a land area of 1,516m^2. This building footprint does not consider significant further expansion of the scheme.

Timescale
This phase could be developed by 2035 and could potentially be developed within the same timescale as phase 2. It is reliant on stages 2 and 3 of the Western Harbour Arm planned development.

Key Network Risks and Considerations
The main network risks include the development of a biofuel CHP plant/power station, connection risk, accessing the tunnel to take heat beneath the canal, crossing the railway line, the potential transport disruption caused by developing the network and locating the plant / power station and energy centre in a space confined area (the plant will need to be larger to serve this network and so this risk is increased).

Although the majority of potential heat demand comes from the private sector (mainly residential buildings) and 53% from planned developments, the connection risk is potentially lower for this network as 23% of demand arises from social housing. As data was unavailable at the time of the study, the viability of connection to Adur Homes properties requires further investigation.

This network option is further investigated and high level financial case sensitivity and risk is further assessed in Chapter 4.

3.3.7 Scenario B Summary

In the absence of a low cost and low carbon source of heat such as a biofuel power station, large heat networks are not viable in the Shoreham Harbour area.

Large scale Gas CHP is deemed unsuitable due to weak financial viability and the onerous requirements and high risks associated with a large number of private wire arrangements with mainly residential users.

The financial case for a MSHP to serve Phase 1a is only potentially viable if the scheme receives RHI at least 80% of the current rate. Due to the timescale of the development and the future of this scheme being uncertain, this high risk option is deemed unviable.

A summary of the Scenario B priority networks is shown in Table 41.

Table 41: Summary of scenario B phases

Phase	Priority scenario network	Network trench length	Estimated CAPEX	25 Year Financial Case				Completion
				Payback	IRR	NPV	Carbon savings	
1a	3MW Gas CHP	1.7 km	£5,027,405	12 years	8%	£3,393,328	3,700 tonnes	2020
1b	13MWth Biofuel CHP	6.4 km	£8,869,164	11 years	9%	£6,798,594	6,459 tonnes	2020
2	20MWth Biofuel CHP	7.3 km	£9,856,177	8 years	13%	£14,855,413	10,042 tonnes	2035
3	20MWth Biofuel CHP	13 km	£17,352,885	10 years	10%	£17,617,009	14,396 tonnes	2035
4	20MWth Biofuel CHP	21 km	£26,746,217	11 years	9%	£23,032,923	20,548 tonnes	2035

If the majority of potential heat demands connect to the network and then, under the assumptions stated in Table 5, there may be marginal but potentially viable financial cases for the network phases above.

Key risks include the development of a biofuel plant, connection risk, accessing the tunnel to take heat beneath the canal, crossing the railway line, the potential transport disruption caused by developing the network and locating the energy centre in a space confined area.

As there is a significant land requirement in a confined area there may be more than one location required for peak and reserve boilers. Potential locations for peak and reserve gas boilers include the biofuel CHP site and the stated WSCC owned sites. The location and operation of peak and reserve boilers will require further assessment at the feasibility stage.

The associated risks and approach to engaging with developers are assessed in sections 4.2 and 5 respectively.

4 ASSUMPTIONS, RISK AND SENSITIVITY ANALYSIS

4.1 Assumptions and Operating Parameters

Operating parameters, financial values and assumptions used in this report are shown in Table 42. All proposals and assumptions are in line with available information the CIBSE/ADE Heat Networks: Code of Practice for the UK.

Table 42: Costs and revenue assumptions and sources of data

Costs and revenues	Value	Reference/Justification
CCL	0.193 p/kWh	HMRC CCL rate from 1 April 2015
CRC	£16.40 / tCO_2	2014/2015 rate given in *CRC Energy Efficiency Scheme guidance for participants in Phase 2 (2014-2015 to 2018-2019)*
RHI tier 1 for MSHP	0.0884 p/kWh	Ofgem tier 1 rate for water/ground source heat pumps installed after 1 July 2015. This applies to the first 15% of the annual rated output.
RHI tier 2 for MSHP	0.0264 p/kWh	Ofgem tier 1 rate for water/ground source heat pumps installed after 1 July 2015. This applies to the remaining 85% of the heat pump's rated output.
Cost of heat purchased from EGPS	0.5 p/kWh	Based on high level discussions with EGPS
Natural gas tariff	2.5 p/kWh	Current market value
Unit price for heat sales	3.5 p/kWh	Competitive tariffs based on information received from the client team and businesses (mainly for 2014)
Electricity tariff (day)	10 p/kWh	
Electricity tariff (night)	6.5 p/kWh	
Electricity export tariff	4.5 p/kWh	Current market tariff
Energy centre electricity tariff (day)	9.0 p/kWh	Based on current market tariffs
Energy centre electricity tariff (night)	6.0 p/kWh	Based on current market tariffs

Table 43: Technology details assumptions and sources of data

Technology details	Value	Reference/Justification
Peak and reserve gas boiler efficiency	85%	Expected efficiency of new boiler
CHP heat efficiency	46%	Efficiencies from CHP Quality Assurance (CHPQA) Programme considering size of plant and number of units
CHP electrical efficiency	41%	Efficiencies from CHP Quality Assurance (CHPQA) Programme considering size of plant and number of units
Average annual COP for MSHP	3.5	Previous experience from Denmark

Table 44: Financial interest rate assumptions and sources of data

Financial interest rates	Value	Reference/Justification
Natural gas tariff	2.5%	Nominal high level assumption
Grid electricity tariff		
Electricity sales (private)		
Electricity sales (export)		
RHI	2.5%	Nominal high level assumption based on current trends
Value of CCL	2.5%	
Services and repairs	2.5%	
Cost of heat purchased	2.5%	
Value of heat sales	2.5%	
NPV	3.5%	Treasury Green Book

Table 45: Emissions factor assumptions and sources of data

Emissions factors	Value	Reference/Justification
Grid electricity	0.46219 $kgCO_2/kWh$	DEFRA 2015 Carbon factors
Natural gas	0.18445 $kgCO_2/kWh$	DEFRA 2015 Carbon factors

4.1 Sensitivity Analysis

The sensitivity of the high level financial cases for the network options presented in Masterplanning & Prioritisation are shown below. Key parameters for analysis include energy tariffs, capital cost, operating cost, heat sales, gas input costs, electricity input costs and heat offtake cost.

This sensitivity analysis will provide further insight into key risks (assessed in 4.2) and inform the overall conclusions and recommendations of the study.

4.1.1 Energy tariff forecast

A comparison of the financial cases using the fixed 2.5% annual inflation and the DECC central scenario price forecasts is summarised in Table 46.

Table 46: Scenario A and B - price forecast comparison[49]

	2.5% annual inflation		DECC central scenario	
Financial case period	**25 years**	**40 years**	**25 years**	**40 years**
Scenario A phase 1				
IRR	7%	8%	6%	7%
Net present value	£8,271,631	£20,386,849	£4,457,947	£11,742,087
Payback	13 years	14 years	14 years	14 years
Scenario A phase 2				
IRR	7%	9%	6%	7%
Net present value	£15,197,019	£35,139,949	£8,599,622	£20,423,176
Payback	13 years	13 years	14 years	14 years
Scenario A phase 3				
IRR	7%	9%	6%	7%
Net present value	£20,925,870	£48,241,221	£11,084,828	£27,120,691
Payback	13 years	13 years	14 years	14 years
Scenario B phase 1a – Gas CHP				
IRR	8%	7%	10%	11%
Net present value	£3,393,328	£4,968,662	£4,846,203	£7,805,765
Payback	12 years	15 years	12 years	12 years
Scenario B phase 1b – Biofuel CHP				
IRR	9%	10%	8%	9%
Net present value	£6,798,594	£14,528,009	£4,513,353	£8,788,577
Payback	11 years	11 years	12 years	12 years
Scenario B phase 2 – Biofuel CHP				
IRR	13%	14%	11%	12%
Net present value	£14,855,413	£26,159,409	£10,759,233	£17,359,237
Payback	8 years	9 years	9 years	9 years
Scenario B phase 3 – Biofuel CHP				
IRR	10%	11%	9%	10%
Net present value	£17,617,009	£33,596,533	£12,519,615	£22,063,433
Payback	10 years	10 years	10 years	10 years
Scenario B phase 4 – Biofuel CHP				
IRR	9%	11%	8%	9%
Net present value	£23,032,923	£45,760,764	£15,790,944	£29,383,797
Payback	11 years	11 years	11 years	11 years

[49] N.B. The Scenario A and B phases are not equivalent i.e. Phase 2 in scenario A is not the same network as phase 2 in scenario B.

The variations in IRR and NPV, between the two scenarios, arise mainly from the difference in energy tariff increases. In the fixed annual inflation scenario gas prices increase by 269% and electricity by 134% over 40 years, whereas in the DECC central scenario gas prices increase by 120% and electricty by 178% to 2035 after which values remain constant.

4.1.2 Heat demand and connection risk

Figure 54 summarises the effect of changing total heat demand on the financial viability of each phase of scenario A.

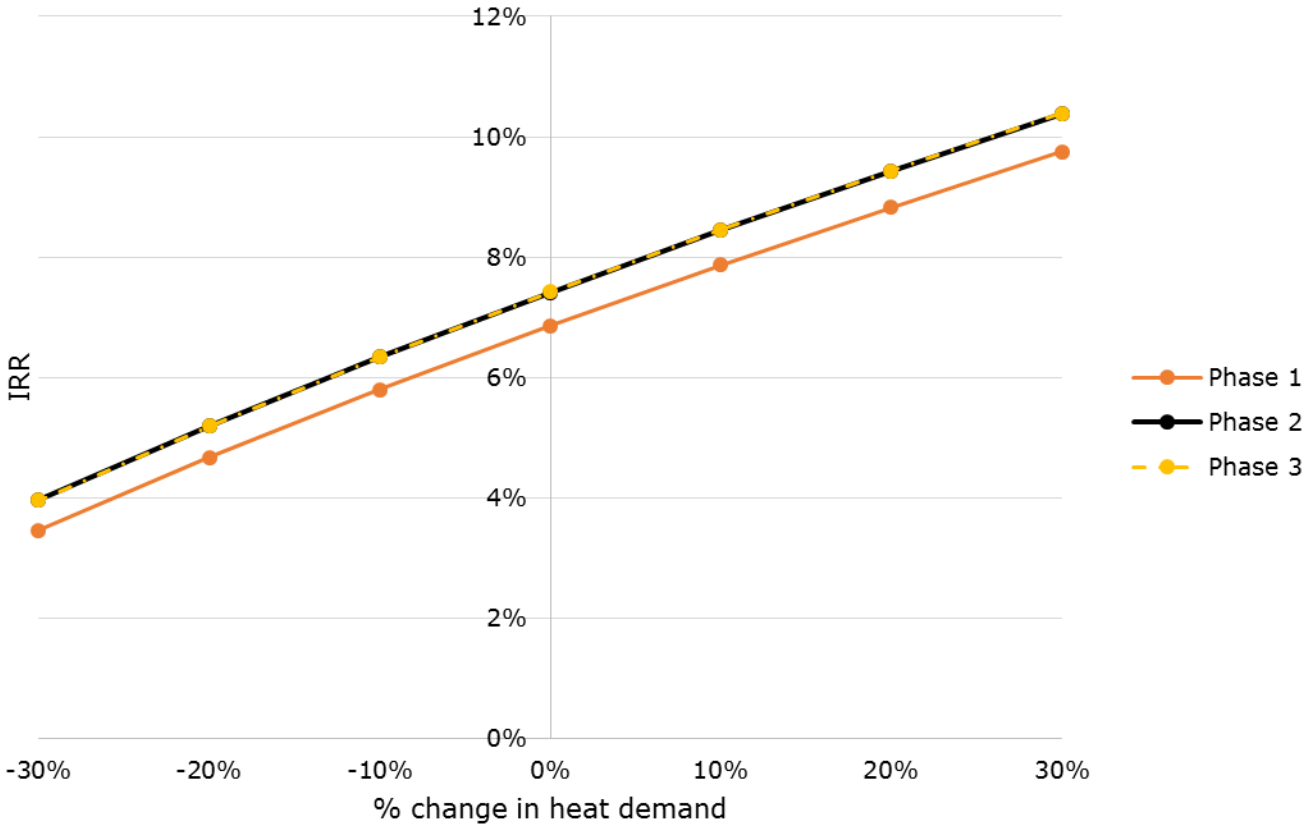


Figure 54: Scenario A heat demand sensitivity (heat demand variations against IRR)

For phase A1, a 17% reduction in total heat demand reduces the IRR to below 5% and would be likely to make the project unviable. For phases A2 and A3 a 22% reduction in total heat demand reduces the IRR to below 5%.

To provide context, Table 47 shows the priority heat loads for each phase as percentages of the total phase heat demand.

Table 47: Scenario A priority heat loads

Key Heat Loads		Heat demand kWh	% of total phase heat demand		
			Phase 1	Phase 2	Phase 3
1	King Alfred Development	7,255,423	-	7.9%	5.4%
2	Southlands Hospital	2,098,015	-	2.3%	1.6%
3	79-81 Brighton Road, Parcelforce site	1,916,455	-	-	1.4%
4	Western Harbour Arm Flats 2	1,642,056	2.9%	1.8%	1.2%
5	Stevens Court	1,620,567	-	1.8%	1.2%
6	Shoreham Academy	1,562,004	-	1.7%	1.2%
7	Southlands Hospital Development	1,547,579	-	1.7%	1.2%
8	Western Harbour Arm Flats 9	1,495,338	2.6%	1.6%	1.1%
9	Western Harbour Arm Flats 10	1,285,635	2.3%	1.4%	1.0%
10	Shoreham Airport Development	1,167,563	-	-	0.9%
11	Mountbatten Court	1,157,072	-	1.3%	0.9%
12	Adur Civic Centre Redevelopment	1,141,989	2.0%	1.2%	0.9%
13	Benson Court	1,128,728	-	1.2%	0.8%
14	South Portslade, residential 1.1	1,060,371	1.9%	1.1%	0.8%
15	Ricardo Industrial Building 1	1,049,386	-	-	0.8%
16	Western Harbour Arm Flats 1	984,789	1.7%	1.1%	0.7%
17	Shoreham College	968,426	-	1.0%	0.7%
18	WHA Stage 3 Flats 7	958,113	-	-	0.7%
19	WHA Stage 3 Flats 10	935,883	-	-	0.7%
20	Western Harbour Arm Flats 21	894,758	1.6%	1.0%	0.7%
21	WHA Stage 3 Flats 3	877,344	-	-	0.7%
22	WHA Stage 3 Flats 6	869,934	-	-	0.7%
23	WHA Stage 3 Flats 4	849,186	-	-	0.6%
24	WHA Stage 3 Flats 11	842,517	-	-	0.6%
25	Ropetackle North, Block E	836,160	-	0.9%	0.6%
26	WHA Stage 3 Flats 5	834,366	-	-	0.6%
27	WHA Stage 3 Flats 13	830,661	-	-	0.6%
28	Holmbush Shopping Centre, Marks & Spencer	815,256	-	-	0.6%
29	Holmbush Shopping Centre, Tesco	789,516	-	-	0.6%
30	Vega	783,237	1.4%	0.8%	0.6%
31	WHA Stage 3 Flats 12	778,050	-	-	0.6%
32	Higgidy	772,550	1.4%	0.8%	0.6%
33	WHA Stage 3 Flats 14	764,712	-	-	0.6%
34	Grazing land southwest of flyover	757,745	-	-	0.6%
35	Ropetackle Arts and Business Centre	723,240	-	-	0.5%
36	Ricardo Industrial Building 5	718,020	-	-	0.5%
37	Infinity Foods Coop	684,590	1.2%	0.7%	0.5%
38	Holmbush Shopping Centre, McDonalds	676,296	-	-	0.5%
39	Aldrington Basin, PortZED Development	673,014	1.2%	0.7%	0.5%
40	WHA Stage 2 Flats 7	667,641	1.2%	0.7%	0.5%

Figure 55 summarises the effect of changing total heat demand on the financial viability of each phase of scenario B.

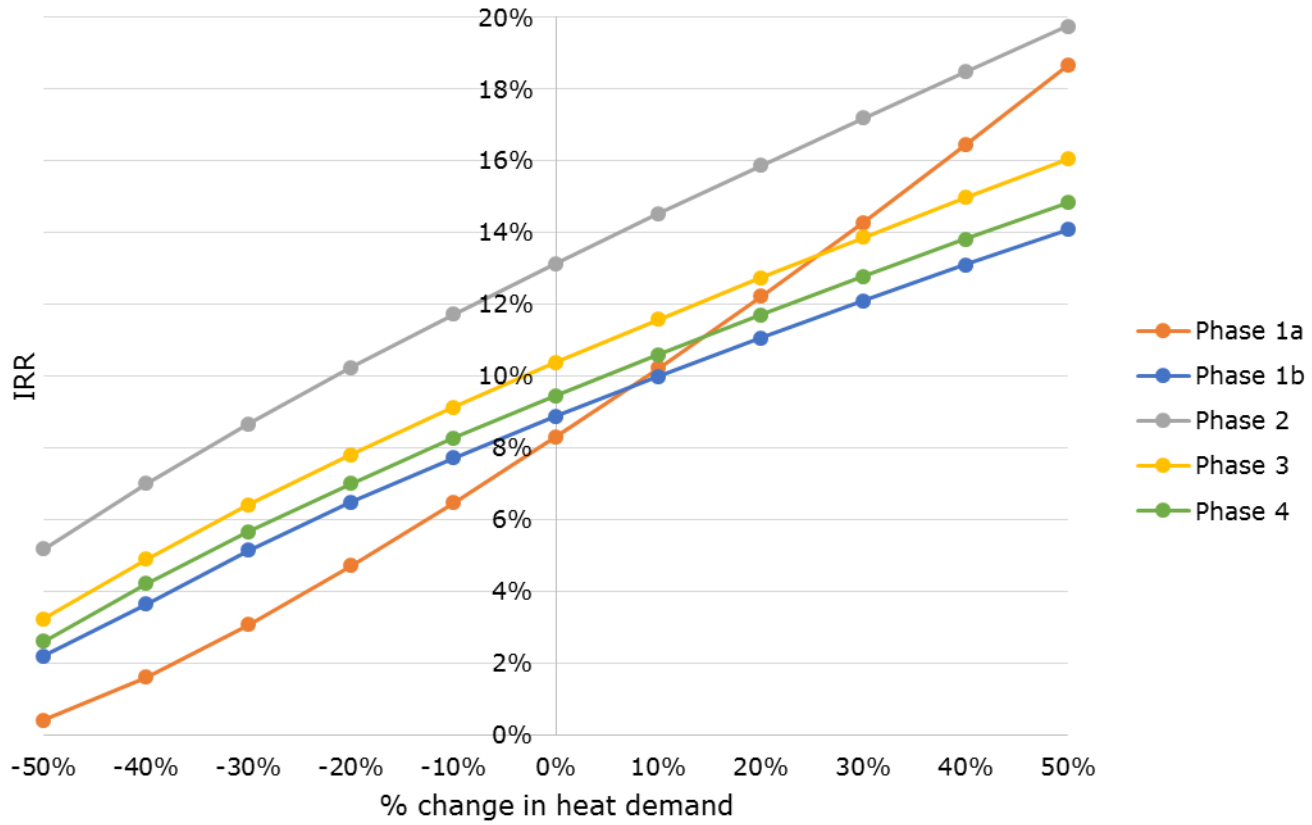


Figure 55: Scenario B heat demand sensitivity

For phase B1a, an 18% reduction in total heat demand reduces the IRR to below 5% and would likely make the project unviable. Phases B1b, B3 and B4 show lower sensitivity and reductions of over 30% are required to reduce the IRR to below 5%. As phase 2 has the strongest financial case a reduction of over 50% is required to reduce the IRR to below 5%.

Table 48 highlights the priority heat loads for each phase in terms of a percentage of the total phase heat demand.

Table 48: Scenario B priority heat loads

	Key Heat Loads	Heat demand kWh	% of total phase heat demand				
			Phase 1a	Phase 1b	Phase 2	Phase 3	Phase 4
1	King Alfred Development	7,255,423	-	-	-	-	6.8%
2	Southlands Hospital	2,098,015	-	-	-	-	2.0%
3	79-81 Brighton Road, Parcelforce site	1,916,455	-	-	3.9%	2.7%	1.8%
4	Western Harbour Arm Flats 2	1,642,056	9.5%	5.1%	3.4%	2.3%	1.5%
5	Stevens Court	1,620,567	-	-	-	-	1.5%
6	Shoreham Academy	1,562,004	-	-	-	-	1.5%
7	Southlands Hospital Development	1,547,579	-	-	-	-	1.4%
8	Western Harbour Arm Flats 9	1,495,338	8.6%	4.6%	3.1%	2.1%	1.4%
9	Western Harbour Arm Flats 10	1,285,635	7.4%	4.0%	2.6%	1.8%	1.2%
10	Mountbatten Court	1,157,072	-	-	-	-	1.1%
11	Adur Civic Centre Redevelopment	1,141,989	6.6%	3.5%	2.4%	1.6%	1.1%

Key Heat Loads		Heat demand kWh	% of total phase heat demand				
			Phase 1a	Phase 1b	Phase 2	Phase 3	Phase 4
12	Benson Court	1,128,728	-	-	-	-	1.1%
13	South Portslade, residential 1.1	1,060,371	-	-	-	1.5%	1.0%
14	Western Harbour Arm Flats 1	984,789	5.7%	3.0%	2.0%	1.4%	0.9%
15	Shoreham College	968,426	-	-	-	-	0.9%
16	WHA Stage 3 Flats 7	958,113	-	-	2.0%	1.3%	0.9%
17	WHA Stage 3 Flats 10	935,883	-	-	1.9%	1.3%	0.9%
18	Western Harbour Arm Flats 21	894,758	5.2%	2.8%	1.8%	1.2%	0.8%
19	WHA Stage 3 Flats 3	877,344	-	-	1.8%	1.2%	0.8%
20	WHA Stage 3 Flats 6	869,934	-	-	1.8%	1.2%	0.8%
21	WHA Stage 3 Flats 4	849,186	-	-	1.7%	1.2%	0.8%
22	WHA Stage 3 Flats 11	842,517	-	-	1.7%	1.2%	0.8%
23	Ropetackle North, Block E	836,160	-	-	-	-	0.8%
24	WHA Stage 3 Flats 5	834,366	-	-	1.7%	1.2%	0.8%
25	WHA Stage 3 Flats 13	830,661	-	-	1.7%	1.2%	0.8%
26	Vega	783,237	-	-	-	1.1%	0.7%
27	WHA Stage 3 Flats 12	778,050	-	-	1.6%	1.1%	0.7%
28	Higgidy	772,550	-	-	-	1.1%	0.7%
29	WHA Stage 3 Flats 14	764,712	-	-	1.6%	1.1%	0.7%
30	Infinity Foods Coop	684,590	-	-	-	1.0%	0.6%
31	Aldrington Basin, PortZED Development	673,014	-	-	-	0.9%	0.6%
32	WHA Stage 2 Flats 7	667,641	3.9%	2.1%	1.4%	0.9%	0.6%
33	St Paul's Lodge	658,564	-	-	-	0.9%	0.6%
34	WHA Stage 3 Flats 2	657,267	-	-	1.4%	0.9%	0.6%
35	Eastbrook Primary Academy (North site)	654,308	-	-	1.3%	0.9%	0.6%
36	Western Harbour Arm Flats 6	653,562	3.8%	2.0%	1.3%	0.9%	0.6%
37	Ingram Court, flats 1-38	648,560	-	-	-	-	0.6%
38	Milward Court	639,766	-	-	-	-	0.6%
39	WHA Stage 2 Flats 8	639,483	3.7%	2.0%	1.3%	0.9%	0.6%
40	Pyroban	638,895	-	-	-	0.9%	0.6%

4.1.3 Other key variables[50]

This section considers the effect that other key variables have on capital cost, operating cost, heat sales, gas input cost, electricity input cost and heat offtake cost.

Scenario A

The sensitivity analysis for scenario A phases 1, 2 and 3 are shown in Figure 56, Figure 57 and Figure 58 respectively.

[50] Sensitivity analysis was conducted using DECC central scenario for energy tariff increases.

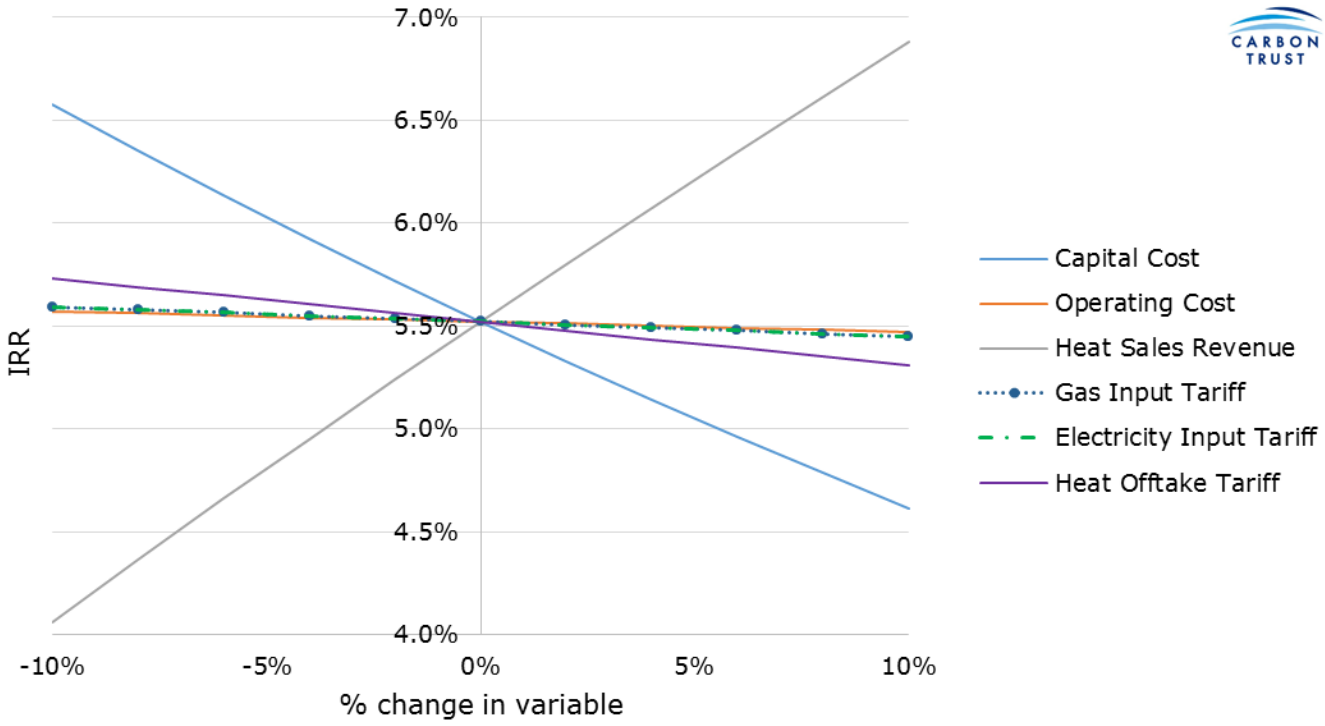


Figure 56: Scenario A phase 1 sensitivity analysis

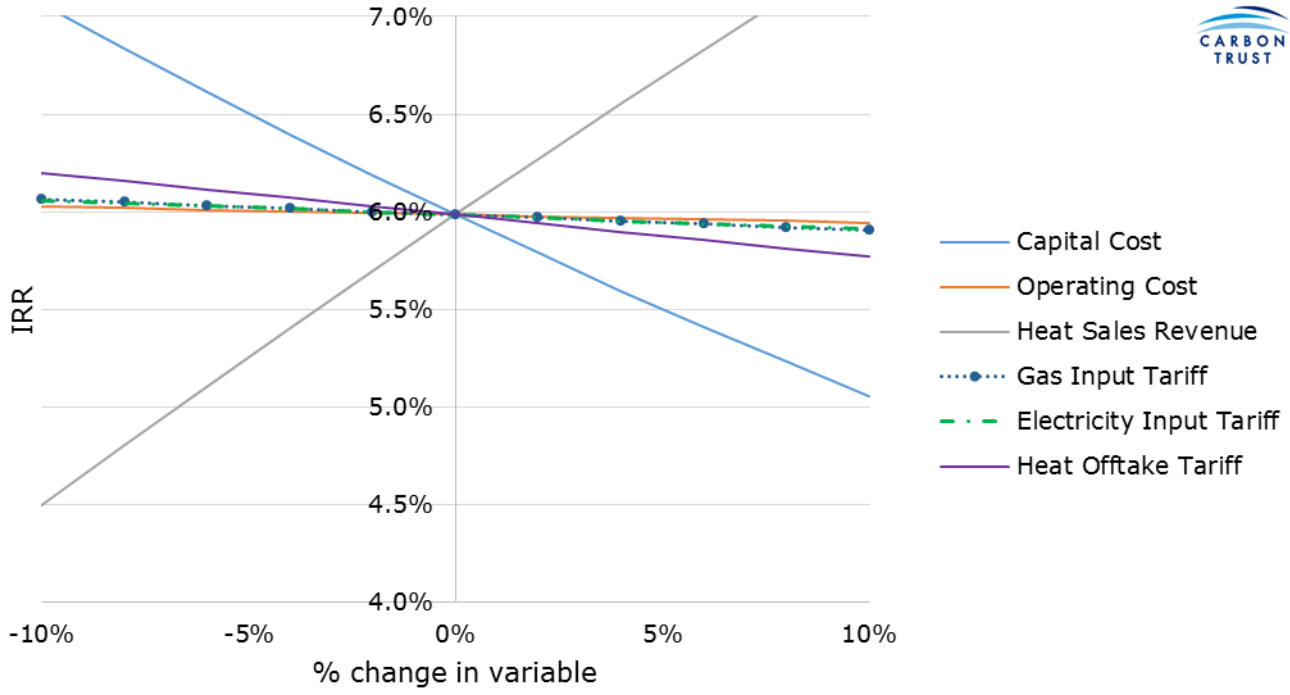


Figure 57: Scenario A phase 2 sensitivity analysis

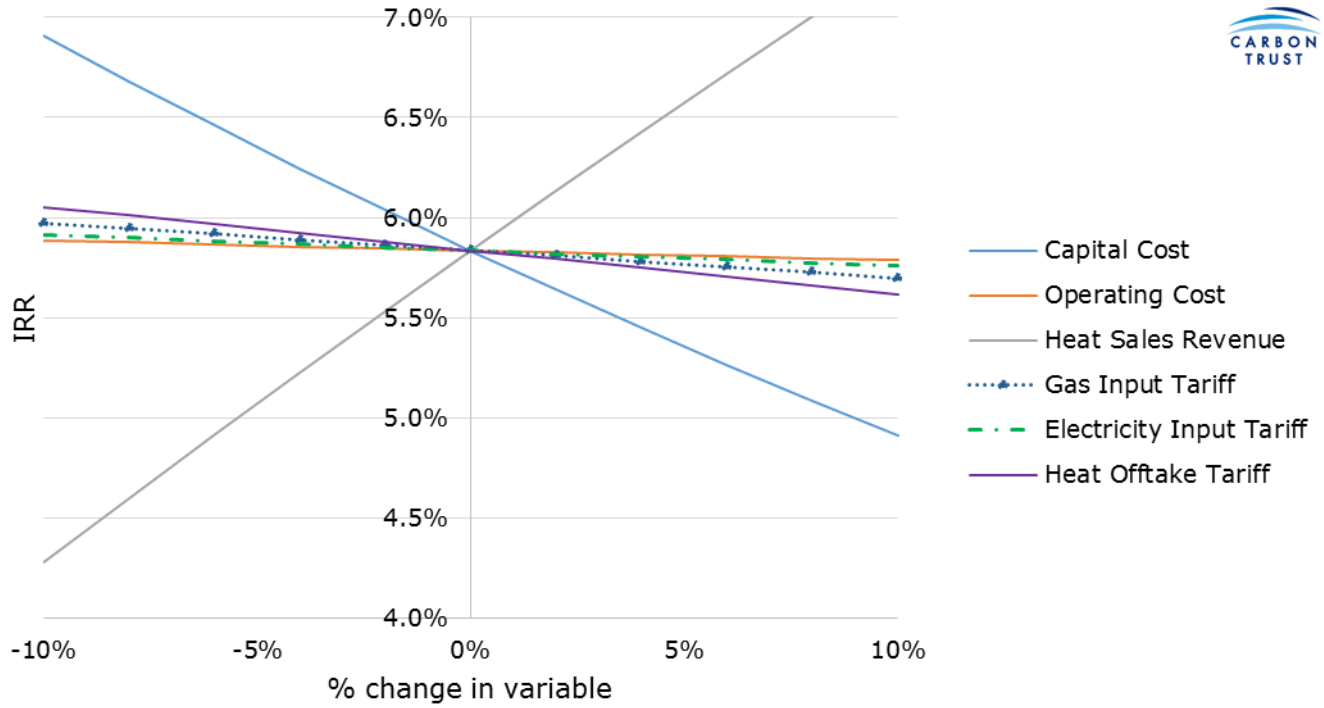


Figure 58: Scenario A phase 3 sensitivity analysis

The key sensitivity parameters and risks shown above are the price of heat sales and the capital cost. Small changes in gas cost, electricity cost and operating costs are less significant for the busienss case.

As heat offtake costs from EGPS are relatively low, variations have a limited impact over the 20% range shown. However, if take off costs are increased by 100% (to £0.01/kWh), then the IRR is reduced to below 5% for the secenario A phase 1 network. Therefore heat offtake costs are critical.

Scenario B
The sensitivity analysis for scenario B phase 1a for a gas CHP is shown in Figure 59.

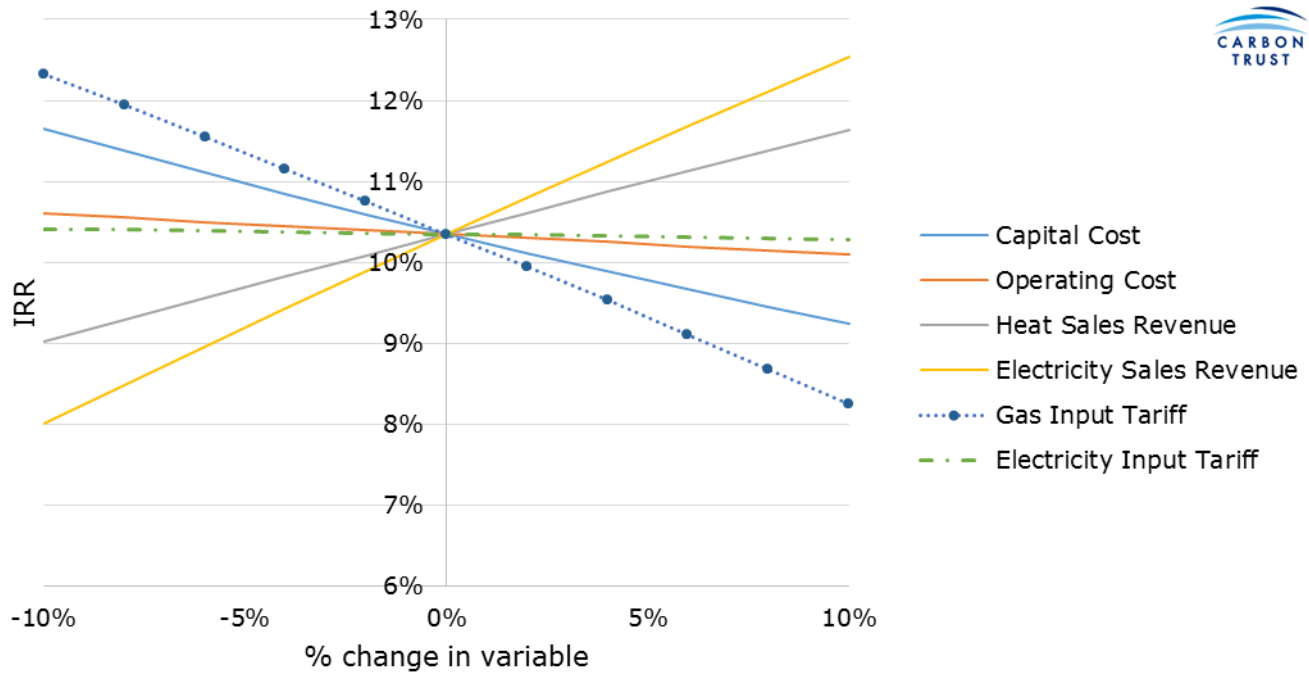


Figure 59: Scenario B phase 1a gas CHP sensitivity analysis

As expected, the key sensitivity parameters and risks for the gas CHP network are the electricity sales tariff and the natural gas tariff. The heat sales tariff and the capital costs also have a significant impact on the IRR.

The sensitivity analysis for the scenario B phases 1b, 2, 3 and 4 (Biofuel CHP networks) are shown in Figure 60, Figure 61, Figure 62 and Figure 63.

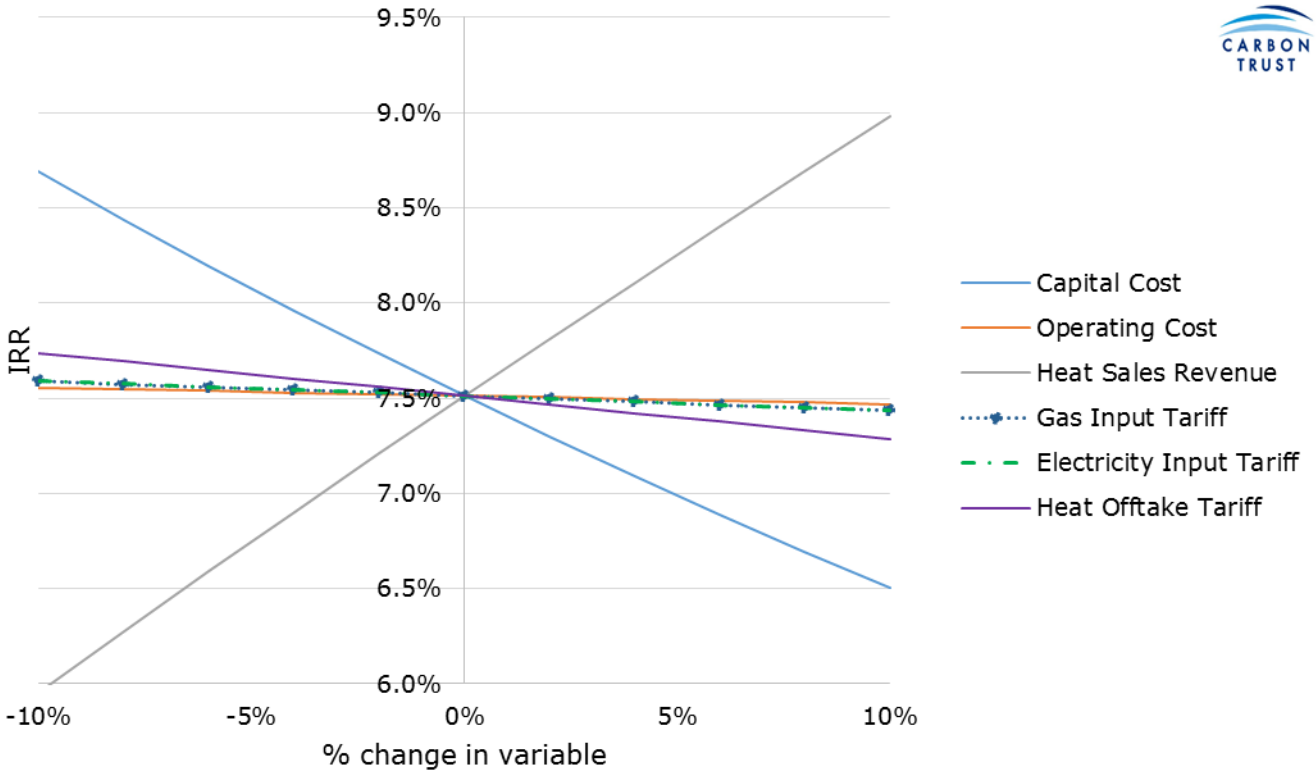


Figure 60: Scenario B phase 1b Biofuels CHP sensitivity analysis

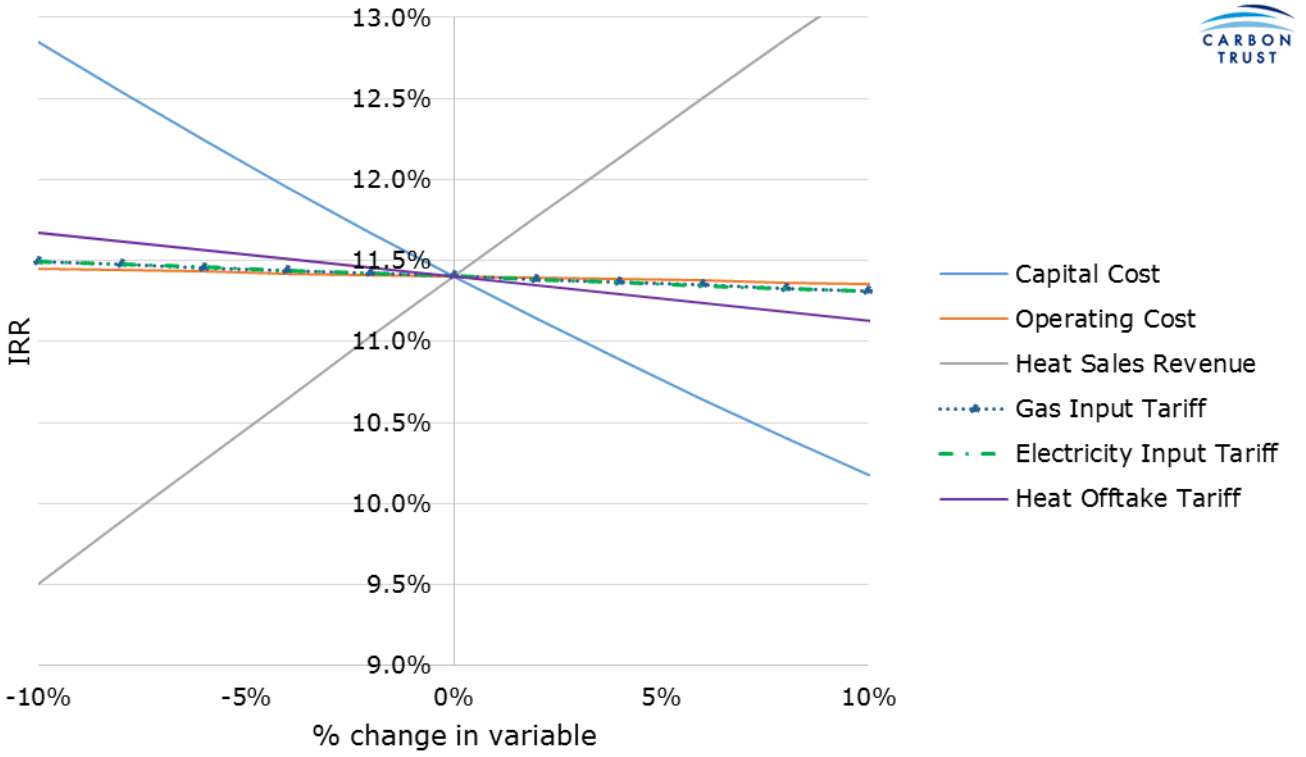


Figure 61: Scenario B phase 2 biofuels CHP sensitivity analysis

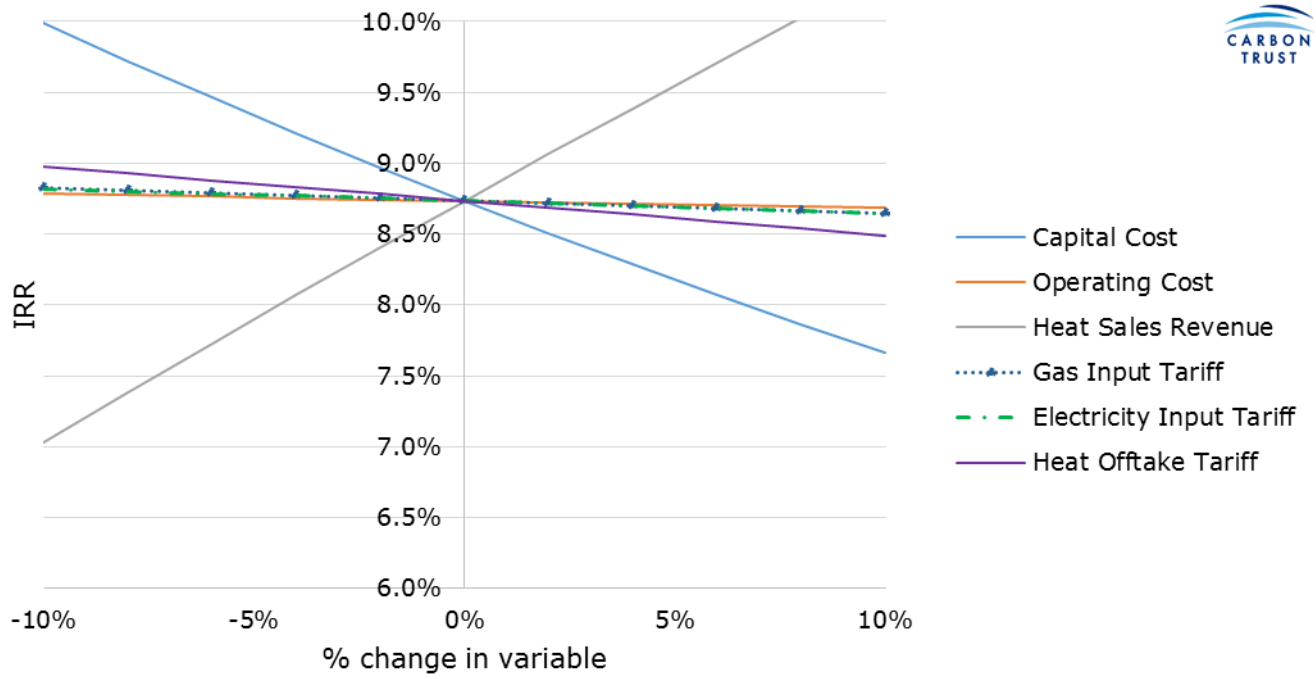


Figure 62: Scenario B phase 3 biofuels CHP sensitivity analysis

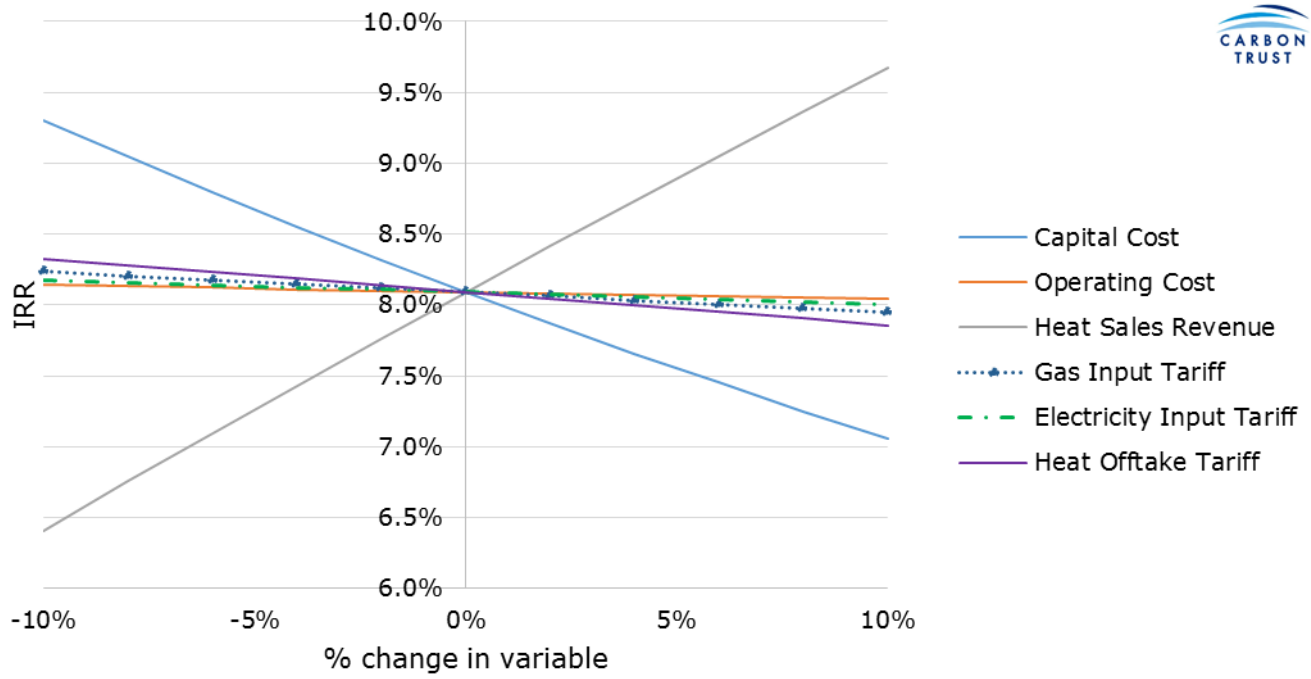


Figure 63: Scenario B phase 4 biofuels CHP sensitivity analysis

As in sceanrio A, the key sensitivity parameters for the network phases are the heat sales tariff and capital costs. Changes in the price of gas, electricity, purchase of heat and operating costs have a smaller impact on the IRR.

As heat offtake costs from the biofuel CHP plant are assumed to be relatively low, variations have a limited impact over the 20% range shown. However, for example, if take off costs are increased by 160% to (to £0.013/kWh), then the IRR is reduced to below 5% for the secenario B phase 1b network.

4.1.4 Summary

Key sensitivity parameters for Scenario A include heat demand, heat offtake price, price of heat sales and capital cost. Key sensitivity parameters for Scenario B include heat demand, value of electricity and electricity demand (phase 1a – see 3.3.2), heat offtake price, price of heat sales and capital cost.

For both scenarios reductions in total heat demand of between 17% and 51% will make the options unviable. The key heat loads for both network scenarios are Western Harbour Arm developments (stage 1), Adur Civic Centre redevelopment, King Alfred Development. As these are planned private sector developments there are high associated risks. A summary of the impact of key heat demands on network viability is shown in Table 49.

Table 49: Summary of priority heat demands and impact on financial viability of network options

		% heat demand reduction to reduce IRR <5%	% of total phase heat demand			
			Western Harbour Arm developments		Adur Civic Centre redevelopment	King Alfred development
			Stage 1	Stages 2&3		
Scenario A	Phase 1	*17%*	29%	-	2%	-
	Phase 2	*22%*	18%	-	1%	8%
	Phase 3	*22%*	13%	12%	1%	5%
Scenario B	Phase 1a	*18%*[51]	90%	-	7%	-
	Phase 1b	*31%*	51%	-	4%	-
	Phase 2	*51%*	33%	31%	2%	-
	Phase 3	*40%*	23%	22%	2%	-
	Phase 4	*35%*	15%	15%	1%	7%

For both scenarios reductions in total heat demand of between 17% and 51% will reduce the IRR to below 5% and will be likely to make the options unviable. The key heat loads for both network scenarios are Western Harbour Arm developments (stage 1), Adur Civic Centre redevelopment, King Alfred Development. As these are planned private sector developments there are high associated risks.

For scenario A phase 1, if offtake costs are increased by 100% then IRR is reduced to below 5% and the option is likely to be unviable. As EGPS will receive significant benefits if useful heat is provided to a network, the likelihood of heat offtake price being prohibitive is low for senario A.

If scenario B phase 1b offtake costs are increased by 160% over the assumed cost, then the option is likely to be unviable. The development of a large heat network may have significant financial advantages for a biofuel CHP company. However heat offtake may increase cost and impact electricity generation and so there is a risk that this parameter will siginifcantly affect financial viability. Detailed discussions over offtake cost will need to be held with any potential developer and useful heat offtake could be addressed as part of planning requirements.

The conclusions from the sensitivity analysis inform the key risks and issues examined in section 4.2.

4.2 Issues and Risks

Table 51 outlines potential risks and issues that apply to all networks. A key showing the level of risk is shown in Table 50.

Table 50: Risk level key

Low risk	
Medium risk	
High risk	

[51] This includes associated reduction in private wire arrangements for those developments that do not connect to the network.

Table 51: Summary of risks and issues that apply to all networks

	Risk/Issue	Risk level	Rationale	Mitigating measure/action
1	Complex strategic priorities for heat networks due to numerous and diverse project partners.		A wide range of strategic priorities were identified from various project partners and stakeholders.	The consultant team has reviewed policy and strategic documentation and undertaken detailed consultation with project partners in order to review and discuss network priorities.
2	Low linear heat density within heat map area.		Although previous studies have indicated potential viability for heat networks within the heat map area, linear heat densities are relatively low.	The heat mapping exercise has identified heat demands and density and the consultant team has provided recommendations on project viability. It is unlikely that a large heat network will be viable without a source of low cost, low carbon heat such as EGPS.
3	Accessing accurate building and energy data from a diverse range of stakeholders including local businesses.		SEL received historical energy data from 28 of 217 organisations contacted. Variable levels of data were received from project partners and, at the time of the study, no data was available for Adur Homes properties.	Partners signed MoU committing to prompt provision of info. In order to progress the study in line with agreed timescales, the consultant team set a cut-off point to provide data and where this was not available data was modelled and verified using benchmarks. An asset register is currently being updated for Adur Homes.
4	Where organisations were unresponsive, or not open to consultation, heat demands are verified using industry benchmarks.		For the 394 potential heat loads where data was not available (103 of which are planned developments) heat demands were developed from heat profile modelling verified using CIBSE benchmark data. Detailed heat demand modelling of key heat loads was undertaken according to best practice and best available information. The hourly, daily and annual heat demand of the individual buildings was calculated and the distribution losses based on proposed pipe routes, specification	CIBSE provide credible industry benchmarks that are widely used for heat demand modelling. However as they are derived from building energy data prior to 2008, there is a risk that they are less accurate for heat demands for modern buildings (due to more efficient thermal performance etc.). This risk has been mitigated by using the 'good practice' benchmark figures (as opposed to 'typical practice') and for all new development and modern buildings a boiler efficiency of 85% has been assumed (as opposed to 75% average for older buildings). The consultant team has a database of hundreds of hourly annual demand profiles for a wide range of building types and these were adapted to provide an indicative heat demand profile for each site and to verify the benchmark data used.

	Risk/Issue	Risk level	Rationale	Mitigating measure/action
			and operating parameters to gauge heat demand identified.	Some of the industrial heat loads modelled may require different temperatures for their processes. This has not been fully considered at this stage. If progressed, further work will need to be conducted at the feasibility stage to review installed capacity and type of existing heat generating plant etc that could be served by the proposed network. The process of integrating the network with the buildings, and processes to maximise heat that can be delivered by the network e.g. pre heat options where high temperatures are required will not be accurately understood until this has been conducted.
5	Heat demands for vacant buildings have been included.		There is no current heat demand at a small number of vacant buildings. Potential heat demand within these buildings has been modelled and included in this study. These buildings include vacant warehouses and offices. This heat demand makes up less than 3% of the calculated overall demand in the heat map area and buildings are clearly highlighted in Appendix 2 – Energy Data.	Heat demands within vacant buildings have been verified from heat profile modelling that utilises CIBSE benchmarks based on space heating only. This heat demand makes up less than 3% of the overall demand of the heat map area and has been included to provide an indication of potential heat demands when these units are occupied.
6	Planned developments are critical to network viability and changes to planned developments alter the modelled heat demand and high level financial cases for the network options.		Heat demands for proposed developments were assessed according to latest knowledge, information and development plans. The modelled heat demand for the Western Harbour Arm and King Alfred developments and Adur Civic Centre redevelopment are based on development plans that may change.	If plans change, the impact upon the schemes must be assessed. This is a straightforward exercise that can be conducted by using SEL's bespoke in-house heat demand modelling software. Project partners should undertake detailed consultation with all potential developers and, in particular, those seeking to bring forward Western Harbour Arm developments (stage 1), Adur Civic Centre redevelopment, King Alfred Development and identify business cases for

	Risk/Issue	Risk level	Rationale	Mitigating measure/action
			As these are critical to the viability of network options, there is significant risk. I engagement with developers is not achieved or developers are not interested in network offer then network options are unlikely to be viable (see Figure 64, Table 47 and Table 48).	planned developments to connect to the network (from the developer's perspective). The approach to engaging with developers and utilising the planning system is discussed in Chapter 5.
7	Network options presented do not allow connection of key future developments.		As both scenarios are phased schemes, important consideration has been given to future-proofing to ensure that the network has the capacity to serve additional buildings and future developments.	All sites identified by project partners and allocated for potential development in local plans have been considered in the heat-mapping and careful consideration is given to future proofing, whilst not at the expense of efficient operation in the short and medium term. The technical design implications of future proofing (particularly with regards to the sizing of plant and pipe work) are suitable and appropriate in the short term but there is a clear route to expand (network costs reflect this). Future proofing will need to be further considered if progressed to the feasibility stage.
8	The capital costs for installation of scheme and network are higher than estimated within the high level financial viability assessment.		Sensitivity analysis indicates that the impact of higher capital costs would be significant for all network scenarios. If the financial model does not provide a representative picture of the true cost of the network, and the likely financial benefits or the economic assessment does not provide sufficient information to secure funding, then the network plan will not progress.	All project costs are based on a combination of supplier quotes, industry costing tools and previous project experience. The consultant team hold a broad knowledge of the actual costs of installing a district heating scheme including costs for plant and equipment supply and installation, energy centre construction, distribution pipe work supply and installation, trench excavation and re-instatement. Optimism bias[52] has been considered when deriving project costs but no specific percentage adjustment has been made to the overall CAPEX.

[52] There is a demonstrated, systematic, tendency for project appraisers to be overly optimistic. To redress this tendency appraisers can make explicit, empirically based adjustments to the estimates of a project's costs, benefits, and duration. As highlighted in the Treasury Green Book, it is recommended that these adjustments be based on data from past projects or

	Risk/Issue	Risk level	Rationale	Mitigating measure/action
9	Physical barriers to the development of the network opportunities identified at master planning stage prevent implementation of scheme or lead to CAPEX increase and viability issues.		Potential barriers include the railway line, key utilities infrastructure, main roads (particularly the A259 for all phases), surface water drains, hard digging conditions, areas of non-Council owned land.	The main physical barriers, issues and constraints within the study area have been considered during the masterplanning process. GIS layers including Council owned land and main gas routes were reviewed and heat map area surveyed (on foot) for obvious barriers. This will require further investigation at the feasibility stage, particularly regarding crossing the railway line where existing bridges/underpasses may be crowded with services. This could be a serious limiting factor for the connections to the North of the railway, both practically and gaining permission from Network Rail to install the pipes may prove to be a difficult process. Excavation of level crossings may prove problematic and negotiations will need to start at the earliest possible stage. At the feasibility stage, the client's representatives will also need to further liaise with local Highways, Environmental Health and Planning Departments and utilities companies.
10	As part of this study, no communication was received from Scottish Power in relation to providing information on Shoreham Power Station (SPS).		The client has previously achieved very little engagement with Scottish Power and both the client and consultant team were unsuccessful in establishing contact with the organisation. The low utilisation and scheduled decommissioning date of this peaking	Assuming SPS significantly increases operating hours, of the network routes proposed in Chapter 3, all the scenario A phases and phases 2-5 described in scenario B would be compatible with heat take off. However, the cost of this heat offtake and the cost of the heat itself will have major implications for the viability of the network and operation of SPS.

similar projects elsewhere, and adjusted for the unique characteristics of the project in hand. In the absence of a more specific evidence base, appraisers are encouraged to collect data to inform future estimates of optimism, and in the meantime use the best available data.

	Risk/Issue	Risk level	Rationale	Mitigating measure/action
			plant means that, unless there are significant changes in operation, SPS cannot been considered as a reliable potential heat source.	
11	Transport disruption caused when installing the network.		The largest pipes (potentially up to flow and return - DN400) would extend along the A259 and the associated trench width would be approximately 2.5m.	Detailed consultation will need to be conducted with Highways departments and project management of network installation carefully considered and planned. Pipe routes follow soft verges and pavements wherever possible and trenching costs allow for onerous project management.
12	Difficult ground conditions encountered due to groundwater and contaminated land.		Liaison with Local Authority Highways and Planning departments suggest that there are groundwater and contaminated land issues for areas of the pipe route.	Contaminated land issues will require detailed assessment prior to the development of phase 1 networks. Groundwater conditions may require pipework and joints to be further protected and insulated, potentially increasing CAPEX. These issues have been considered in this study but will require detailed consideration at the project feasibility stage.
13	Existing social housing does not incorporate communal heating systems.		No energy or asset data was received from Adur Homes and the cost of retrofitting buildings has not been included in the financial assessments.	The consultant team has spoken to Adur Homes staff and conducted visual inspections of social housing blocks included in the study as potential key loads. Evidence suggests there are a mix of communal boilers, individual wet systems and electrical heating. A condition survey of should be completed by the end of 2015 and these issues will require detailed consideration at the feasibility stage in order to further assess viability and benefits for the association and its residents.

	Risk/Issue	Risk level	Rationale	Mitigating measure/action
14	Planned developments are critical to network viability - engagement with developers is not achieved or developers are not interested in network offer.		The viability of all network options is reliant upon planned developments. As stated the Western Harbour Arm developments are critical.	Effective early engagement with developers is essential and the benefits of connecting new buildings to a network need to be made clear. The approach to engaging with developers and utilising the planning system is discussed in Chapter 5.
15	Accessing mains gas supplies for peak and reserve boilers.		There is currently only a single gas supply to the main port area south of the A259 and this provides gas at high pressure to SPS. It may not be possible to access this supply. A 500mm gas main runs along the north side of the A259 as there is a 500mm gas main running along the road.	If this project is progressed to the feasibility stage, this should be further investigated with initial applications made to Southern Gas Networks. Accessing the mains gas supply will have lower associated risk to the north of the Port.
16	The average heat sales tariff achieved is lower than that assumed in the high level financial assessment.		The high level financial assessment assumes that heat is sold to end users at 3.5p/kWh. This is a competitive average tariff based on information received from the client team and local businesses (mainly for 2014). It considers current energy tariffs, cost of generation and the category of end users. The tariff is relatively low compared to other schemes in the UK and allows for the competitive offer that is likely to be required in order to ensure successful engagement and the required levels of connection.	If this project is progressed to the feasibility stage, this should be investigated in more detail to further consider end users and tariff variations.

	Risk/Issue	Risk level	Rationale	Mitigating measure/action
17	Low cost, low carbon heat from EGPS not being used if a network is not developed		If EGPS is developed without an associated heat network, the local authorities may receive criticism and reputational damage for failing to facilitate a network coming forward if the potentially low carbon, low cost heat resource is perceived as being wasted.	If the project partners do not enter into an SPV to develop the scheme themselves, they may undertake a series of corporate actions to assist in promoting and enabling the scheme including: • Facilitating engagement between key stakeholders, such as site businesses and developers • Provision of land for construction of peak and reserve energy centres and pipe routes • Commitment to long term purchasing contracts with the network operator • Engagement and support with planning consents and highways activities • Encouraging heat intensive businesses (potential key anchor loads) to locate in the vicinity of EGPS • Providing resource and financial assistance in delivering feasibility and design work

Table 52 outlines the potential risks and issues specific to scenario A.

Table 52: Assessment of risks and issues specific to Scenario A

	Risk/Issue	Risk level	Rationale	Mitigating measure/action
A1	Edgeley Green Power Station (EGPS) is not developed.		Planning permission has been obtained and construction of EGPS is due to start late 2015.	Other potential heat source technologies have been considered in scenario B.
A2	Access cannot be gained to the tunnel beneath the Port canal.		EGP have an early form of agreement with Scottish Power allowing them access to the tunnel for export of heat and electrical power.	Further details of this agreement should be considered as and when they are made available.
A3	The cost of heat from EGPS is prohibitive.		If the cost of heat from EGPS increases by 100% from the figure assumed in this study then the financial cases for the network options are likely to become unviable under all	The development of a large heat network has significant benefits for EGP and the company are keen to drive the project forward. Detailed discussions over offtake cost will need to be held at the feasibility stage.

	Risk/Issue	Risk level	Rationale	Mitigating measure/action
			potential governance and development arrangements.	
A4	Limited availability of land for peak and reserve energy centre(s).		EGPS and associated networks are located in a space confined area with limited available space for large peak and reserve plant.	Potential energy centre locations have been considered with regards to the size of land required, the potential for location on Council owned land, proximity to the main pipe route of networks and the availability of adequate gas supply. If this project is progressed to the feasibility stage, the availability of land for energy centres either at the EGPS site or on the WSCC owned land specified in this study should be further investigated. If the land requirements for a single peak and reserve energy centre are too onerous then more than one location could be secured. When locations have been confirmed, planning requirements could be developed to safeguard these sites.
A5	The length of time that may be required to take project decisions through the collective governance processes of the project partners.		The development plan for EGP has not yet been confirmed but, if developed, it is likely to begin construction in 2016. Key decision on how the project partners support network development will need to be aligned with EGP's development plan.	Once the development plan for EGPS is confirmed, in consultation with EGP, the project partners should develop a clear timescale of decisions that must be met in order to align with EGP's development plan. Relevant stakeholders within the project partner organisations should be thoroughly briefed on the likely process in order that they are prepared and to avoid delays.

Table 53 outlines the potential risks and issues specific to scenario B.

Table 53: Assessment of risks and issues specific to Scenario B

	Risk/Issue	Risk level	Rationale	Mitigating measure/action
B1	Limited availability of land for gas CHP and peak and reserve energy centre(s).		The network is located in a space confined area with limited available space for large peak and reserve plant. The location of Energy Centre /potential peak and reserve energy centre is currently on WSCC-owned land at Southwick Recycling Centre.	Potential energy centre locations have been carefully considered with regards to the size of land required, the potential for location on Council owned land, proximity to the main pipe route of networks and the availability of adequate gas supply for gas CHP or gas boiler peak and reserve plants. If this project is progressed to the feasibility stage, the availability of land for energy centres either on the WSCC owned land specified in this study, development land along the Western Harbour Arm or the site of the proposed EGPS should be further investigated. If the land requirements for a single peak and reserve energy centre are too onerous then more than one location could be secured. When locations have been confirmed, planning requirements could be set to safeguard these sites.
B2	Limited capacity of mains gas supply.		Southern Gas Networks have confirmed that a 500mm gas main runs next to the proposed site for Energy Centre /potential peak and reserve energy centre. There may be available capacity (this would only be guaranteed as part of a formal application).	If this project is progressed to the feasibility stage, the gas supply to this site should be further investigated and an application made.
B3	A developer for a biofuels CHP plant on the proposed EGPS site does not come forward.		There is a low linear heat density in the Shoreham area and a large source of low cost, low carbon heat is required to support a viable district heat network opportunity of any significant scale.	As there are currently no plans for a plant of this kind, if EGPS is not developed, there may be an opportunity for the public sector and planners to adopt an enabling role, encouraging new developers to come forward, supporting their activities where appropriate.

	Risk/Issue	Risk level	Rationale	Mitigating measure/action
			Due to the nature of the site and the high risk private wire opportunities, a biofuel CHP plant would be the most viable heat source. The high level financial cases for scenario B networks do not include the development costs of the Biofuels CHP plant and it is assumed that heat is purchased as a by-product. This option assumes that heat is sold to the network by a third party operator at the same tariff used in the EGPS options.	
B4	The cost of heat from Biofuel CHP plant is prohibitive.		For phase 1b, if the cost of heat increases by 160% (from the figure assumed in this study) then the network options become unviable.	The development of a large heat network may have significant advantages for a biofuel CHP company, but operation may be impacted. Detailed discussions over offtake cost will need to be held with any potential developer and useful heat offtake could be addressed as part of planning requirements.
B5	Changes in energy tariffs affect financial case for gas CHP.		For phase 1a, gas and electricity prices have a more significant impact on the projects financials. For CHP schemes, the operating viability relies upon the 'spark gap' i.e. the difference in price between gas and electricity. If gas prices rise faster than those of electricity, then the viability is reduced.	Values for energy savings and sales are based on current prices and future increases based on a standard rate of inflation and DECC's central cost scenario are compared in Chapter 4.

	Risk/Issue	Risk level	Rationale	Mitigating measure/action
B6	Access cannot be gained to the tunnel beneath the Port canal.		As the biofuel CHP plant is not planned, in the event that EGPS is not developed, Scottish Power have not yet been consulted on the viability of another plant accessing the tunnel for export of heat and electrical power.	In the event that EGPS is not developed and another developer comes forward, this will require detailed consultation on the part of the developer.

5 PLANNING CONSIDERATIONS

The following section outlines how the stakeholders in the SHRP can offer support to develop heat networks through planning policy and developer engagement.

5.1 Introduction to planning for decentralised energy

Planning policy and planning teams play a crucial role in the development of heat network projects. The role of planners in district heating is to provide appropriate policy and supporting guidance to developers in the development or extension of networks. Planners should work with developers to guide them on masterplanning and the design of their heating infrastructure to maximise the opportunities for and benefits of connecting to the heat network. The technical and financial work undertaken for this study will provide an evidence base for planning policy across the authority areas, including the Joint Area Action Plan (JAAP), Brighton and Hove City Plan Part Two and Adur Local Plan; and to support developer negotiations, drafting planning conditions, Section 106 Agreements and the Community Infrastructure Levy.

Heat loads have been evaluated from planned developments in the heat map area, in addition to the demands from existing buildings that could provide potential heat loads. BHCC, ADC and Shoreham Port Authority were consulted and strategic site maps and development plans were reviewed to ensure that future heat demands were modelled to inform network development, phasing and future proofing. Projected demand is shown in section 2.1.3, Table 3.

Whilst Heat Network development has been consistently supported by government, there are currently unknowns around whether planning policy; and tools like use of Section 106 Agreements; and the Community Infrastructure Levy (CIL) can take a lead role on driving delivery of heat networks. Uncertainty has been generated by initiatives such as the Housing Standards Review and consequent emphasis on 'viability', the removal of the Zero Carbon aspiration for housing, and Allowable Solutions. At the same time, Government has repeatedly expressed support for heat network delivery through the planning system, as stated in the Written Ministerial Statement (Planning Update March 2015) and the Productivity Plan 'Fixing the Foundations'. Since the publication of the Housing Standards Review the Carbon Trust has successfully defended heat network policies at planning hearings in Horsham and Crawley. The Horsham policy, which was also drafted by the Carbon Trust, is therefore taken as a template for some of the recommendations below.

The Carbon Trust is seeking to work with other organisations such as the Town and Country Planning Association and Planning Advisory Service with a view to achieving greater clarity, sharing experiences and making guidance more widely available. Viable policy wording is suggested based on previous experience and advice provided on approaching implementation. As discussed with both Adur and Brighton and Hove planners, getting the right planning policy wording is an element in laying the foundations for successful implementation of district heating schemes. It is important that planning authorities are equipped to support negotiations with developers to secure effective heat network implementation and connection.

Heat networks are strategic, enabling infrastructure. As such, appropriate planning policy can help ensure they are implemented in the right place, at the right time, and achieve the desired outcomes. It should be noted that, as a means of delivering heat rather than a generation technology, heat networks are not necessarily best dealt with through renewable energy generation polices. For example, the Greater London Authority has produced a separate Heat Network Manual which was developed as part of an integrated heat network development strategy and has been a useful guidance tool in driving heat network development and connection[53].

[53] Greater London Authority. (2014). London Heat Network Manual. http://www.londonheatmap.org.uk/Content/uploaded/documents/LHNM_Manual2014Low.pdf

A summary of key planning issues and actions is shown in Table 54 below.

Table 54: Planning Issues and Actions

Issue	Action
Safeguarding network routes	Identify any immediate threats to imminent or longer-term future network routes. Safeguard identified routes from developments that would compromise use of the route, and consider opportunities arising from development on network routes, such as multi-utility trenches.
Safeguarding energy centre sites	Where extra land is needed to accommodate energy centres or peaking and reserve plant, sites should be identified and safeguarded in order to avoid compromising the development or expansion of networks. This is relevant to the Scenario A energy centre locations identified on i) the lorry park near the Southwick Waterfront and the recycling centre near the Western Harbour Arm, both of which are owned by WSCC.
District heating hierarchy	This could include a requirement to: connect to an existing network, provide a network on-site, design buildings to be connection-ready, and install communal rather than individual heating systems.
Waste heat sources	Ensure any sources of significant waste heat are identified and flagged up to establish whether heat can feed into a new or existing network. Consider requirements to recover heat as well as electricity from relevant facilities. Encourage location of heat sources near heat users. This has already been done for EGPS, but further discussions with SPS are recommended to understand the future of this plant.
Developer contributions	Developer contributions could be sought through Community Infrastructure Levy charges or from Section 106 Agreements. If using CIL, be aware that a policy forcing a developer to install an on-site network and a CIL charge could constitute 'double-counting'.
Technical standards	The CIBSE Heat Networks Code of Practice (CoP) is the best-available source of technical standards to reference in planning policy. However, bear in mind that referencing the CoP will not achieve anything unless its implementation is supervised and enforced through planning policy (see 5.3.2). The CoP only contains high-level technical guidance and an outline of design principles which will have to be built on in the case of the connection to an operating network.
Local Development Orders (LDOs)	LDOs for district heating have not been widely used outside London and a careful cost-benefit analysis should be undertaken before deciding to develop an LDO. However, they do offer an opportunity to make network installation easier and are a public statement of a council's commitment.

5.2 Overview of relevant planning policies

The following section outlines the current planning policies that are in place and how they can be used to support the development of heat networks. Recommendations for changes to Plan policies are included at paragraph 5.3.

5.2.1 Shoreham Harbour Joint Area Action Plan

The Shoreham Harbour Joint Area Action Plan (JAAP) acts as the main planning document for Shoreham Harbour, sitting alongside both the Adur Local Plan and Brighton & Hove City Plan and setting strategic direction for the next 20 years. The joint policy document will be adopted by Adur District Council, Brighton & Hove City Council and endorsed by West Sussex County Council. Joint area action plans are important in bringing together interested local planning authorities, particularly where there is a regeneration area across planning authority boundaries.

The Shoreham Harbour JAAP is currently being drafted and the Client has advised that the addition of content to this policy document would be possible. The development of heat networks aligns with the

first strategic objective for the Shoreham Harbour JAAP, which is "*to ensure all new developments use energy and water as efficiently as possible, use energy from renewable technologies, use sustainable materials*" and highlights that "*the Port will be supported in becoming an important hub for renewable energy generation*"[54].

The JAAP currently identifies delivery of a district heating network as a recommended harbour-wide opportunity, given that the proposed development offers a high density mix of uses that would be suitable for district heating. It identifies that coordinated developments may enable the development of low-carbon district heating, noting that installation costs could be reduced through the involvement of an Energy Service Company (ESCo).

Policy JAAP 13 focusses on the delivery of low and zero-carbon solutions, stating that "*opportunities should be sought to provide linked district heating networks within the Strategic Site areas".* The policy currently states that "*where a CHP system is delivered on-site, all buildings are required to connect. These may be provided as self-contained systems on site, or link into a wider network incorporating other parts of the JAAP area and beyond"*[2]*.* It will be important to demonstrate viability of the Scenario A & B networks outlined in this study to show that the identified heat networks will provide heat more efficiently (in both carbon and cost terms) both now and in the future.

Over-arching strategic policies have been set out in the Adur Local Plan and the Brighton and Hove City Plan Part 1 (see below for specific policies). Detailed development control policies will be included in the JAAP, the Adur Local Plan and the Brighton & Hove City Plan (in both parts 1 and 2).

5.2.2 Brighton and Hove City Plan Part 1 and 2

The Brighton and Hove Submission City Plan Part 1 is a Development Plan Document for Brighton and Hove City Council and has been developed under the City Council's Local Development Framework. Part 1 has been formally submitted and Part 2 commences development in 2016. The Client has advised that amended policy wording could be added to Part 2 or included as part of supplementary planning guidance.

Local requirements for decentralised energy can be set out in a Development Plan Document following production of evidence such as heat network opportunities mapping and master-planning. This should consider the positive benefits that heat networks could bring to communities and the wider economy. The technical and financial outputs of this study contribute to the evidence base on which to base policies for heat networks in plan-making.

Brighton & Hove Submission City Plan outlines Development Area policies which include requirements or recommendations referring to heat networks, where opportunities were found in the *Brighton and Hove Renewable and Sustainable Energy Study (2012)*. For example, for those Development Areas where enhanced heat network opportunities were identified such as Development Area Policy DA8 Shoreham Harbour at paragraph 3.112, they include text: "*Development within this area will be encouraged to consider low and zero carbon decentralised energy and in particular heat networks and to either connect where a suitable system is in place (or would be at the time of construction) or design systems so that they are compatible with future connection to a network.*"[55]
Policy CP8 Sustainable Buildings also supports heat networks, requiring development proposals to demonstrate how the development "*connects, makes contributions to low and zero carbon energy schemes and/or incorporates provision to enable future connection to existing or potential decentralised energy schemes*"[3].

The Brighton and Hove City Plan Part 2 will give further details on site allocations and development management policies.

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[54] Shoreham Harbour Regeneration. Joint Area Action Plan (2014)
http://www.adur-worthing.gov.uk/media/media,121462,en.pdf
[55] Brighton and Hove City Plan Part 1. DA8 Shoreham Harbour para 3.112 (2013)
http://www.brighton-hove.gov.uk/sites/brighton-hove.gov.uk/files/downloads/ldf/Feb13_Submission_City_Plan_Part_One.pdf

5.2.3 Adur Local Plan

The Adur Local Plan will provide a strategy for development in Adur up to 2031 and will be key in facilitating the regeneration of Adur. The plan is at advanced stage in its development and as a consequence major changes would be difficult to implement. However, the Client has advised that minor amendments such as tweaking the wording or adding bullet points would be possible.
Policies 18, 19 and 20 in the Local Plan already show support for heat networks. Policy 20 (decentralised energy and stand-alone energy schemes) in particular requires an assessment of the potential to create or connect to heat networks, along with the potential to expand networks over time to be included with planning applications for major developments.

5.2.4 Infrastructure Delivery Plans

An Infrastructure Delivery Plan (IDP) forms part of an evidence base to support a Local Plan. IDPs identify existing infrastructure provision, current shortfalls and existing and future needs to support new development over the plan period. The IDP includes an assessment of impacts and changes affecting infrastructure and identifies key requirements to support the potential delivery of future development. They are a key element of the LDF framework and inform the setting of any Community Infrastructure Levy Charging Schedules. IDPs are subject to annual revision providing opportunities for amendments.

The Adur Infrastructure Delivery Plan (2013) is currently in draft and there is no mention of district heating.

The Brighton and Hove Infrastructure Delivery Plan has included reference to decentralised energy and heat networks since 2013 following findings of the Energy Study. The most recent addendum (2014) includes reference in the *Environment* section: *Environmental Protection & Renewable Energy'*. References to district heating provision is referred to as 'Important', with various expected timeframes, many identified as 'ongoing' and included as requirements under the following Plan policies:

Development Areas

- *District Heating networks/ Combined Heat and Power (CHP) technologies linked to new developments.*
- *Proposals should explore opportunities for district heating/combined heat and power technologies and energy savings linked to new development across all DA1-DA8 Development Areas and major development site.*
- *To support DA 8 Shoreham Harbour area the Joint Area Action Plan (JAAP) will investigate future possibilities for CHP in association with the existing Power Station and for large scale renewable energy.*

Citywide

- *Large scale sustainable energy development (heat exchange, marine, wind and solar arrays)*
    - *New and existing developments on the seafront and high ground*
    - *DA2 Brighton Marina, Gas Works, Black Rock*
    - *To be informed by emerging JAAP DA8 Shoreham Harbour*

Sites to be identified in Part 2 City PlanCitywide

- *Sustainable development initiatives including renewable and low carbon decentralised energy systems, schemes and installations, carbon reduction and energy efficiency measures, carbon reduction and energy efficiency measures, and air quality management measures*
- *To help deliver reduction in resource use and greenhouse gas emissions, particularly CO2 emissions, in new development. City wide and across priority areas in accordance with reduction targets set in the Brighton & Hove Sustainable Community Strategy and One Planet Framework Action Plan*

5.3 Planning Policy recommendations

It is recommended that local requirements be adopted for decentralised energy which relate to Scenario A priority network identified in Section 3.2 of this report, specifically focussing on the opportunities which are of a scale that could not be achieved by developers alone (i.e. if the proposed network connects to buildings beyond the development).

It is recommended that Scenario B priority networks are not included within planning policy if at the time of implementing said policy, the construction of EGPS can be guaranteed.

It is recommended that the Planning authorities require proposed developments to connect to a network where it exists, or for the development to be designed so that it can connect to a future network where a **viable** network **is identified**. Scenario A and B networks identified in this report could all be considered viable, though policy wording should accommodate alternative options that may become viable in the future, highlighting the need for an ongoing assessment of heat network potential to build a robust evidence base.

It is recommended that developers are required to conduct an assessment of the potential to implement heat networks or alternatively to design systems so that they are compatible to connect to a network in future. Feasibility assessments should be in line with Section 2 of the CIBSE Heat Networks Code of Practice, providing rationale for the preferred option and incorporating a high level assessment of the potential to phase the growth of the network beyond the development area in future. This approach has worked successfully for Horsham District Council.

It is therefore recommended that the following highlighted changes are made to the wording of the JAAP:

Policy JAAP 13: Sustainable Design and Energy

a) A Sustainability Statement will be required to accompany all development proposals within **Strategic Sites 3 and 4** within Adur.
b) A completed Sustainability Checklist will be required as part of all development proposals within the areas of the harbour within Brighton & Hove.
c) All new development will be expected to aspire to achieving zero-carbon status (emitting no net annual carbon emissions from regulated and unregulated energy use), in particular within the Strategic Site areas. This will include the use of passive design measures. Proposals must demonstrate good thermal performance and air tightness to prevent heat loss. Low and zero carbon energy technologies and networks should be incorporated.

Renewable and low carbon energy

d) Developers are encouraged to demonstrate how they can contribute towards Shoreham Port Authority's objective of becoming a hub for renewable energy generation.
e) Within the Strategic Site areas, opportunities should be sought to provide linked district heating networks. This process will be supported by the council/s.
f) Major new developments will be expected to be designed to have the ability to connect to a future district heating network.
g) All new development will be encouraged to consider low and zero carbon decentralised energy opportunities, in particular heat networks, and to either connect where a suitable system is in place (or would be at the time of construction) or design systems so that they are compatible with future connection to a network.
h) An assessment of the opportunities to use low carbon energy, renewable energy and residual heat/ cooling for both domestic and non-domestic developments must be provided with any major planning application. This must include details of:
    a) Any new opportunities for providing or creating new heating networks.
    b) The feasibility of connecting the development to existing heating/cooling and/or CHP networks where these already exist.
    c) Opportunities for the future expansion of any proposed networks and to plan for potential expansion.
i) Where a Combined Heat and Power (CHP) system is delivered on-site, all buildings are required to connect (where it is feasible and appropriate to do so). These may be provided as self-contained systems on site, or link into a wider network incorporating other parts of the JAAP area and beyond.

5.3.1 Planning documents – continuity between planning authorities

Continuity between local planning documents is recommended in order to ensure a level playing field for local developers and to increase the familiarity of those developers with heat network related planning policies. Having similar policies will also help planning authorities exchange experience and best practice on implementation and deal with potential challenges from developers. However, such an approach may be open to challenge and each planning authority should have a local evidence base in place to justify the presence of a heat network policy. This study contributes to the evidence base required at each local planning authority, but an ongoing assessment of heat network potential will be required to ensure robustness of the evidence base as the region undergoes change. The current policies show an equal level of commitment to district heating, but there is a need for each to be strengthened through planning policies. It is recommended that Supplementary Planning Guidance is used to consolidate and clarify individual planning policies in this instance.

The Carbon Trust has provided planning policy advice to both Horsham District Council and Crawley Borough Council, and provided an expert witness to speak on heat network policies at examinations in public for both local plans. In the case of Horsham, Carbon Trust are currently advising on responding to the first developer challenge relating to heat networks. The recommended wording for both Brighton & Hove and Adur is closely based on the wording used by Horsham.

Increasing consistency between local authorities may be beneficial for a number of reasons:

- There may be a relatively low level of understanding of heat networks among developers, which could be a significant barrier to heat network development. Consistent policy and messaging across planning authorities will help developers understand opportunities that heat networks present.
- It is often suggested that working with developers is easier in London because the London Plan applies consistent policy on the heat network hierarchy across all Boroughs. Other neighbouring planning authorities could seek to create similar coordination across area boundaries through synchronised planning policies, approaches and practices.
- Approval of successful policies in one authority could support their approval in other authorities, helping heat network policy become 'normalised' across an area.
- It will help authorities to pool resources and share experience of implementing policies, allowing them to share and build on positive outcomes.
- Due to the scale and complexity of the projects and the difficulty of predicting the business models through which each will be delivered, heat network policy must remain flexible. This is particularly the case where networks have not yet been built and there is a significant level of uncertainty over the details of their implementation. As networks are built out more nuanced planning policy may be appropriate, but highly-specific policy would not be appropriate at earlier stages of development (e.g. HNDU defined stages of heat mapping and energy masterplanning).

It is recommended that:

- Consistency is achieved in the heat network/district energy policies across the Plan documents.

5.3.2 Brighton and Hove City Plan Part 2

It is recommended that the policy wording below is used in the Brighton and Hove City Plan Part 2, which will give further details on site allocations and development management policies. This could also form the basis of supplementary planning guidance. **It is recommended that this policy is adopted on a citywide basis, and applies to all new developments which fall within close proximity to an identified heat network in the heat mapping studies (SEL 2015 and AECOM 2012)**.

Brighton & Hove City Council is streamlining planning policy to reduce, rather than add to, it's adopted planning documents. In making the decision on where to include the policy, the Council should consider the cost of each option and the time necessary to prepare and consult before the policy can come into force. Whilst SPDs can only provide guidance to existing policy and can be costly and time-consuming to produce, SPD adoption may be a good interim measure for technical guidance on how City Plan policies can be implemented, ahead of adoption of City Plan Part 2.

The economics of heat network development can result in circumstances where it takes several years before a planned network is constructed. In these instances, new developments can be required to build in or at least safeguard a route to enable future connection. The planning policy wording outlined below can be used to achieve this, and it is recommended that this applies to all new developments located within close proximity to the Scenario A priority networks identified within this Energy Masterplan.

Future-proofing heat network connections will require the allowance of sufficient space within plant rooms. Table 55 outlines the space requirements for heat substations as advised in the London Plan. The heat substations are usually maintained by the network operator, and as such access will be required to correct faults if they arise.

Table 55: Indicative space requirements for heat exchange substation equipment within building plant rooms.[56]

Heating Capacity, kW (space heating + ventilation)	Approximate building size, m^3	Space required by the heating equipment, m^2
30	1,000-1,500	2
200	10,000-15,000	4
400	20,000-30,000	5
800	40,000-60,000	6

Buildings must also use a centralised communal wet heating system rather than individual gas boilers or electric heating to enable heating system compatibility for the ease of future connection to a heat network. It is recommended that planning policy requires developers to prioritise the selection of communal wet systems for new developments, unless it can be demonstrated that this is not a viable option. These future-proofing measures have been successfully tested and enforced within planning policy across London, the London Plan advises that LPAs can adopt the technical specifications discussed as an SPD.

Possible wording for Brighton and Hove supplementary planning guidance or City Plan Part 2
District Heating and Cooling

Commercial and residential developments in areas identified in the Shoreham Harbour Heat Network Study (2015) will be expected to connect to district heating networks where they exist using the following hierarchy, or incorporate the necessary infrastructure for connection to future networks.

Development should demonstrate that the heating and cooling systems have been selected in accordance with the following heating and cooling hierarchy;

1: Connection to existing Combined Cooling Heat and Power (C) CHP distribution networks
2: Site wide renewable (C) CHP
3: Site wide gas-fired (C) CHP
4: Site wide renewable heating/cooling
5. Site wide gas-fired heating/cooling
6: Individual building renewable heating
7. Individual building heating, with the exception of electric heating

All (C) CHP must be of a scale and operated to maximise the potential for carbon reduction.

Energy Statements

[56] Greater London Authority. (2014). London Heat Network Manual. Pg.41. http://www.londonheatmap.org.uk/Content/uploaded/documents/LHNM_Manual2014Low.pdf

Developments in the study areas and strategic developments should demonstrate and quantify how the development will comply with the heating and cooling hierarchy. The Planning Authority will work proactively with applicants on major developments to ensure these requirements can be met.

Technical specifications for connection to an existing network
All buildings connecting to an existing heat network must adhere to the relevant guidelines set out in Chapter 3 – Design – of the CIBSE Heat Networks Code of Practice for the UK. The Council or their representatives will monitor compliance with the following CIBSE Heat Networks Code of Practice objectives:

***Objective 3.3** – to select suitable building interfaces, direct or indirect connection*
***Objective 3.4** - to design or modify suitable space heating and domestic hot water services systems*
***Objective 3.9** – to achieve an efficient heat distribution system within a multi-residential building and to reduce risk of over-heating*
The developer and their subcontractors will be required to work with the Council and their representatives to ensure heat demand is correctly calculated and that the Code of Practice requirements are correctly understood and implemented.

Technical specifications for connection to a planned network or network under construction:
All buildings required to be 'connection ready' must adhere to the relevant guidelines set out in Chapter 3 – Design – of the CIBSE Heat Networks Code of Practice for the UK. The Council or their representatives will monitor compliance with the following Code of Practice objectives:
***Objective 3.3** – to select suitable building interfaces, direct or indirect connection*
***Objective 3.4** - to design or modify suitable space heating and domestic hot water services systems*
***Objective 3.9** – to achieve an efficient heat distribution system within a multi-residential building and to reduce risk of over-heating*

Feasibility assessments for Heat Networks:
These should be in line with Section 2 of the CIBSE Heat Networks Code of Practice, providing rationale for the preferred option and incorporating a high level assessment of the potential to phase the growth of the network beyond the development area in future

Buildings must also use a centralised communal wet heating system rather than individual gas boilers or electric heating.

Buildings must allow adequate plant room space to allow for connection at a later date (the exact requirement to be agreed with the Council and their representatives – see Table 55*).*

The developer must identify, with the support of the Council or their representatives, and safeguard a pipe route to allow connection between the building and the highway or identified network route where available.

The developer must not in any other way compromise or prevent the potential connection of the building to a planned network.

5.3.3 Adur Local Plan

It is recommended that the policy identified above be included in the Adur Local Plan. However, it might not be possible to amend policy in any meaningful way due to the stage that Adur are at in their consultation timescale. As such, while it is advised to include the more detailed policy above, the existing policy could still be significantly clarified and consolidated as drafted below. Supplementary planning guidance and well defined Section 106 agreements would significantly strengthen the approach taken above, particularly with regard to ensuring buildings are appropriately designed and constructed to be connection-ready (see wording for supplementary planning guidance). It should be noted that a significant level of technical expertise will be needed within the planning team to effectively implement and enforce this type of policy, for example in negotiating on expert areas of technical detail with consultants working on behalf of developers.

Policy 20: Decentralised Energy and Stand-alone Energy Schemes

An assessment of the opportunities to use low carbon energy, renewable energy and residual heat/ cooling for both domestic and non-domestic developments must be provided with any major planning application. This must include details of:

- *Any new opportunities for providing or creating new heating networks.*
- *The feasibility of connecting the development to existing heating / cooling / CHP networks where these already exist.*
- *Opportunities for the future expansion of any proposed networks and to plan for potential expansion.*

Where viable and feasible, commercial and residential developments in areas identified in the** Shoreham Harbour Heat Network Study (2015) **will be expected to connect to district heating networks where they exist or incorporate the necessary infrastructure for connection to future networks.

Amendments to the wording in Policy 20 are suggested below.

5.3.4 Infrastructure Delivery Plans

It is recommended that district heating potential is included in the Adur IDP and where CIL is being adopted, in the Regulation 123 Charging Schedule, using the Scenario A priority network and development areas identified in Section 3.2 of this report.

5.3.5 Technical specifications

Technical specifications to enable the connection of new developments to existing or planned heat networks should be included in Plan policies for Brighton and Hove City Council and Adur District Council using the CIBSE Heat Networks Code of Practice, to ensure that connecting buildings or buildings being constructed as 'connection-ready' or 'future-proofed' are appropriately designed and built to connect to a heat network. If a building is not designed and built to be connection ready then the network operator will be unable to connect it without costly remedial work, or it may be connected and adversely affect the operation and technical and financial performance of the network.

At a high level, developments will be 'connection-ready' if they have a communal wet heating system with variable flow controls and a safeguarded pipe route to allow future connection. Further requirements on pipework insulation requirements, size of heat emitters, temperature of the system, number of port valves etc are outlined in the CIBSE Heat Networks Code of Practice.

It is recommended that:

- Planning conditions require that the applicant demonstrate that development has the capacity for connection to an existing or future heat network.
- Policy requires that 'future-proofing' measures are implemented in line with the minimum requirements outlined in the CIBSE Heat Networks Code of Practice

(http://www.cibse.org/knowledge/cibse-other-publications/cp1-heat-networks-code-of-practice-for-the-uk).

- Policy requires that developers consider the installation of communal wet heating systems which are 'connection-ready', unless it can be demonstrated that this is not viable.

Specific policy wording recommendations are made below.

5.3.6 Local Development Orders

An alternative to traditional planning permission is to adopt Local Development Orders (LDOs). LDOs are made by local planning authorities and give a grant of planning permission to specific types of development within a defined area. They streamline the planning process by removing the need for developers to make a planning application to a local planning authority. LDOs could be used to grant permission for a specific type of heat network within an identified local authority area. This would enable construction to commence once the outlined conditions have been satisfied. For example, the London Borough of Newham used an LDO to enable the staged rollout of a heat network within the Royal Docks Enterprise Zone[57].

It is recommended that the Councils consider the development of LDOs to show support for commercial developers of heat networks and also to speed up construction. Accelerating the deployment of networks also has the potential to deal with the issue of developers not wanting delays to construction through connection to heat networks, given how quickly it's often possible to get a gas supply on site. This is also consistent with the UK Government heat strategy which sets ambitions for the role of the gas grid to diminish over time[58].

5.4 Using the Community Infrastructure Levy and Section 106 Agreements to support the development of heat networks

Local authorities, especially in London, are increasingly looking to use Section 106 Agreements and the Community Infrastructure Levy (CIL) to support the development of heat networks and secure financial contributions to fund district heating infrastructure.

Section 106 Agreements and the Community Infrastructure Levy have had limited application in a district heating context, and as such the strength of this mechanism in supporting heat network development is relatively untested. Consequently, whilst recommendations can be made for the use of Section 106 agreements for district heating, any advice is caveated as it is an evolving policy area.

5.4.1 Section 106 Agreements

Section 106 agreements are legal agreements between Local Authorities and developers which focus on site specific mitigation of the impact of development. They are most commonly used to secure financial contributions towards infrastructure or affordable housing. Section 106 obligations can:

1. Restrict the development or use of the land in any specified way
2. Require specified operations or activities to be carried out in, on, under or over the land
3. Require the land to be used in any specified way
4. Require a sum or sums to be paid to the authority by a specified date or dates or periodically[59]

The legal tests for when you can use a S106 agreement are:

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[57] London Borough of Newham. (2013). District Heat Network Local Development Order https://www.newham.gov.uk/Documents/Environment%20and%20planning/District%20Heat%20Network%20LDO_adopted_20%203%2013.pdf

58 Department of Energy and Climate Change. (2013). The future of heating: meeting the challenge https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/190149/16_04-DECC-The_Future_of_Heating_Accessible-10.pdf

[59] PAS (2015) S106 obligations overview http://www.pas.gov.uk/3-community-infrastructure-levy-cil/-/journal_content/56/332612/4090701/ARTICLE

1. Necessary to make the development acceptable in planning terms
2. Directly related to the development; and
3. Fairly and reasonably related in scale and kind to the development.

There are a range of potential applications of Section 106 Agreements to support heat network development. Current views of the effectiveness of these applications is mixed and they have not been widely tested in this context. At a high level, Section 106 agreements can be used to oblige developers to connect to an existing or planned network, including to set detailed technical standards for the connection of specific buildings where they meet the tests outlined above. Depending on the ownership model adopted they could also be used to collect a general contribution towards the network (bearing in mind the new limits on pooling contributions to 5), connection charges and general administrative charges that could cover the cost of compliance checking. Contributions may be secured where they are directly related to the development and necessary to granting planning permissions in order to meet policy objectives.

The uses of Section 106 agreements in a district heating context can be broken down to the following:

A. To collect connection charges (not recommended)
B. To collect contributions towards heat network development
C. To oblige developers to connect to an existing network / network under construction
D. To oblige developers to connect to a planned network
E. To future proof connections

A. To collect connection charges

A connection charge is an initial charge which is levied by the heat provider of a district heat scheme, whether that be a Local Authority or private sector ESCo. In the UK, it is usually payable by a developer or landlord, but not by the end-user customer. Connection charges cover the cost of installation of the heat substation and any additional pipework required to connect the site. Connection charges have the potential to significantly impact the commercial viability of a district heating scheme.

The level at which connection charges are set will depend on the financial model, the need to incentivise connection, and the strength of planning conditions. Developers will be incentivised to pay a connection charge for district heating if it does not exceed the alternative cost of delivering planning-compliant heat provision including gas supply with individual gas boilers or a community central heating system in addition to the cost of achieving an equivalent level of carbon reduction (e.g. through on-site renewables). The developer will therefore be incentivised to make the contribution to the heat provider, which could be the Local Authority, private sector ESCo, Joint Venture, Special Purpose Vehicle or community-owned company.

In the event that connection to an existing or planned district heat network which is led by the local authority is feasible and viable for a developer, Section 106 agreements can require financial payment to the local authority to enable connection, which would usually correspond with the cost of installing a Heat Interface Unit and any additional pipework required to route the network to the specified development. If the ownership model for the network is not public-sector led, the alternative decision would usually be for the network operator to collect connection charges directly and not through Section 106.

However, the London Heat Manual advises that Section 106 agreements should not include or replace connection charges, which would be levied by the network operator (either public or private).

London Heat Manual
"These contributions - whether through a S106 agreement or through a CIL – would be separate and additional to the connection charge which would be made by the DH network operator to cover the reasonable cost of connection itself."

Whilst unusual, one London Borough has collected a large number of upfront connection charges through Section 106 to collect capital for network construction, this is legally permissible provided that the heat bill standing charge is not towards repayment of network construction capital. However, the change in context between London and other parts of the UK should be recognised. In London, there is increasing difficulty in meeting environmental standards through other means owing to the

high density of development which limits certain technologies, air quality issues and different land values. We recommend that in the case of Shoreham Harbour, this would not be an effective means of raising a significant capital sum towards network construction.

In the mature Scandinavian heat network market, time-incentivised connection charges have been used successfully, offering a discounted connection charge the earlier a building connects, and sometimes even connecting customers free of charge if they connect by a specified deadline. This applies to the whole market, including new and existing developments and end-user customers where planning requires connection. This method serves to de-risk district heating development as it provides the network operator with a committed heat demand to size the network efficiently. If considering this approach, carrying out local soft market testing is advised as the Carbon Trust are not aware of any evidence that this approach would work in the UK.

It is recommended that Section 106 Agreements are not used to collect connection charges, which should instead be collected separately by the network operator. The network operator could carry out soft market testing to determine if time-incentivised connection charges will increase the uptake of district heating in the UK market.

B. To collect contributions towards heat network development

When developments are completed prior to network construction, Section 106 agreements can be used, within limits, to pool developer contributions. Since the introduction of the CIL, the ability of local authorities to use Section 106 payments to pool contributions has been limited. Since April 2015 it is no longer possible to pool contributions from more than five Section 106 agreements towards a single project. It may be possible to split out separate phases of the network to increase flexibility; but the Councils should obtain legal advice on this point.

The appropriateness of collecting contributions towards the development of the network will be influenced by the ownership model and strategic drivers for the network. For example if the network is to be financed through public sector investment to achieve primarily non-financial goals then the public owner and investor may wish to incentivise buildings to connect rather than collect contributions from them with a competitive offer. This may be particularly relevant to heat network schemes that incorporate the Western section of Scenario A Phase 1 & 2, the far western section of scenario A phase 3, Scenario B phase 1a and the western section of scenario B phase 3 & 4, all of which have a high concentration of private sector and development heat demand.

C. To oblige developers to connect to an existing network / network under construction

Exeter City Council use Section 106 Agreements to oblige developers who have development under construction to connect to a network under construction by EON. The Section 106 Agreement obliges them to connect to the network and requires that the developer permits the Council and/or ESCo to implement and maintain the infrastructure on site. This type of agreement could be used when development is constructed at the same time or after network construction.

Exeter City Council, Section 106
The Developer shall connect each Dwelling to a District Heating Facility PROVIDED THAT in the event that the Developer can demonstrate to the reasonable satisfaction of the City Council prior to the Commencement of Development that connecting each Dwelling to a District Heating Facility would not be viable or feasible or would unreasonably delay construction (Reserved Matters Approval having been granted) having regard to all of the circumstances including (but not limited to) the following factors:

1.1 The availability of a District Heating Facility (together with associated infrastructure reasonably capable of providing a constant supply of hot water and space heating services to the boundary of the Development) having regard to the anticipated build programme of the Development;
1.2 The cost (or likely cost) of connecting each Dwelling to any District Heating Facility that may be available having regard to the cost (or likely cost) at that time of connecting dwellings to other district heating facilities in the United Kingdom;
1.3 The terms and conditions to which a connection to any available District Heating Facility will or is likely to be subject;
the Developer shall not be required to connect the Dwellings to a District Heating Facility.

Suggested improvements to the wording above would be to remove the condition that connection is required unless it can be demonstrated that it "*would unreasonably delay construction*". This would protect against the event that a developer is not cooperative as it may be argued that gas supply can be on site very fast, meaning the point at which construction is delayed can be reached very quickly. Section 106 Agreements can also be used to make further specific technical specifications for connection to an existing network / network under construction. These specifications should be developed with the network operator to ensure they are consistent with the existing or under construction network to which the building will connect. These should include detailed specifications for:

- Exact space requirements in plant room
- Flow and return temperatures, particularly the return temperature
- The exact route of pipework between the building point of connection and the heat main
- Internal building systems

It is recommended that Section 106 Agreements are used to oblige developers to connect to existing networks / networks under construction and to set specific technical requirements to enable connection. This will become increasingly relevant as district heating networks are developed over the coming years.

D. To oblige developers to connect to a planned network

Section 106 agreements can be used to require that new developments are designed and built to be connection-ready, if they fall within proximity to an identified heat network. For example, Islington Borough Council specify in a S106 Supplementary Planning Guidance document that major developments should be connection ready if they are located within 500 metres of an existing/planned heat network and that minor developments should connect if they are located within 100 metres of an existing network. The outputs of this Heat Mapping study could be used to identify a list of postcode areas that fall within proximity to an identified heat network, defined as a Heat Priority Area.

Islington Borough Council Planning Obligations (Section 106), November 2013

7.37. All development will be required to contribute to the development of these DENs, including by connecting to networks where these exist in their vicinity (CS 10) unless it is demonstrated that this is either not feasible or not viable. In the case of minor development, whether or not a development will be required to assess the viability of a connection is decided by location of the development (A list of postcodes will be provided on our decentralised energy webpage www.islington.gov.uk/heatnetwork for minor developments to assess opportunities for connection).

7.38 The requirements for connection to DENs are as follows (DM7.3):

Major Developments are required to be designed to be able to connect to a DEN and, unless a feasibility assessment demonstrates this is not reasonably possible,

- *if located within 500 metres of an existing DEN will be required to connect and meet associated charges,*
- *if located within 500 metres of a planned future DEN (likely to be operational within 3 years of planning permission), will be required to provide a means to connect and meet associated charges,*
- *if connection is possible, are required to detail a preferred energy strategy and an alternative energy strategy within their Energy Statements, and*
- *if connection is not possible, should develop and/or connect to a Shared Heating Network (developers will be obliged to look at the neighbouring buildings to assess the applicability of expanding a site wide communal energy network beyond the site to the local neighbourhood)*

Minor developments, if located within 100 metres of an existing DEN (see postcode list on our website at www.islington.gov.uk/heatnetwork), unless it can be demonstrated that this is not reasonably possible, will be required to be designed to be able to connect to a DEN.

This should also include detailed technical requirements to enable future connection, including that developments install a communal wet heating system with variable flow controls and safeguard a pipe route to allow future connection. This should use guidance from Section 3 of the CIBSE Heat Networks Code of Practice for the UK (see suggested wording in section 5.3.4).

It is recommended that Section 106 Agreements are used to oblige developers to connect to planned networks that are being taken forward as a result of this study, specifically relating to Scenario A priority network and development areas identified in Section 3.2 and 3.3 of this report. This should include detailed technical requirements to enable future connection as detailed in 5.4.1 part C.

E. To future proof connections

Section 106 Agreements can be used to future-proof connections within proximity to an identified heat network to ensure that development makes provision for connection to a future DHN expected to be built in the area. As these requirements will be relating to a network that has not yet been constructed (and whose construction may not be guaranteed), they cannot be as specific as requirements for connection to an existing network or a network under construction. Possible paragraphs could include the following:

- Heat in the building must be delivered through a centralised, communal wet system
- Heat in the building should operate at an appropriate temperature for future connection to a heat network. The targeted difference between flow and return temperatures on the primary heat network under peak demand conditions shall be greater than 30°C for supply to new buildings and greater than 25°C for existing buildings. Objective 2.4 of the CIBSE Heat Networks Code of Practice for the UK outlines the preferred temperature design for varying heating systems in further detail.
- Plant rooms should be situated to consider potential future-pipe routes and sufficient space must be allowed for building/network interface equipment (such as heat exchangers). For example, see Stockport Council's Guidance for District Heating Feasibility[60]

[60] Stockport MB Council. (2013). Guidance for District Heating Feasibility. http://www.stockport.gov.uk/2013/2994/developmentcontrol/planningpolicy/dhguidance

- Pipe runs from the plant room to the highway or proposed heat main route [specify if possible] must be protected and remain accessible for future installation

OR

- A pipe run must be provided between the plant room to the highway or proposed heat main route [specify if possible]. Nb. This has proved difficult to implement elsewhere due to the cost involved

To conclude, it is recommended that Section 106 agreements are used to futureproof connections to planned networks that fall within a priority network area identified in Section 3.2 of this report.

Summary

In summary, legal input is recommended when reviewing options A to E above and proposing the most appropriate mechanism for use of Section 106 in supporting the development of heat networks in Shoreham Harbour. Evidence for the effectiveness of options A and B is weak, however there is stronger evidence of the effectiveness of options C, D and E.

Section 106 agreements can be used to oblige developers to connect to existing or planned networks but it should be recognised that if there are cheaper and more convenient options available to the developer then this could cause tension. This highlights the need to have a robust evidence base which identifies and evaluates heat network potential, providing a business case for heat network connection. This coupled with dedicated resource allocated to engage positively with developers will enable heat networks to be developed that benefit all parties.

5.4.2 Enforcing retrospective connection

Different timetables for network construction and new developments mean that a Local Planning Authority may only be able to set policy which requires that a building be 'future-proofed' or 'connection ready', in preparation for the network. In practice this would require the development to have a communal wet heating system, along with other technical requirements as discussed earlier. The extent to which a planning authority could force a connection under such circumstances is unclear and will be tested as more networks are implemented. Results should be monitored by all planning authorities with heat network policies and Councils may also wish to obtain expert legal advice.

In the absence of certainty, a pragmatic approach would be to assume the building cannot be forced to take heat and that the network operator will be reliant on the building owner or operator accepting an attractive connection proposition, which could come at a point of high input fuel costs or at the point where the original plant is due for replacement.

However, issues such as risk adversity to an unknown or unfamiliar technology and the 'hassle factor' (if connecting building operators have to do anything other than a straight swap of plant) will influence decisions so that if a marginally better offer is made, it may not be enough. Other questions include what will happen to the development once it has been built? Will the developer maintain a financial interest? How will properties be sold / leased? And how will occupants be billed for their energy use?

5.4.3 Community Infrastructure Levy (CIL)

The Community Infrastructure Levy (CIL) regulations introduced significant reforms relating to the use of financial contributions. It allows local authorities to raise money for infrastructure that is needed as a result of development. For those local authorities that choose to adopt a CIL Charging Schedule, all new development will be charged at a flat rate on a per metre squared basis, and viability modelling should consequently account for this payment. District heating infrastructure can be funded using receipts from the Levy which could mean there is a new funding stream available to deliver district heating.

Given that both Adur District Council and Brighton & Hove City Council are considering the introduction of Community Infrastructure Levy (CIL) charging schedules in 2017, consideration should be given to how CIL and Section 106 will be used between now and 2017 and subsequent to that date with regards to developer contributions. For example, the Councils could choose to use Section 106 as an interim

measure to collect contributions until the CIL Charging Schedule is introduced. CIL has the advantage that contributions can be pooled from a large number of developments, whereas Section 106 has been limited since April 2015 to five contributions towards a single project.

Lambeth produced a Supplementary Planning Document on Section 106 obligations as an interim measure until CIL took over. It highlights that "*developers will be expected to provide infrastructure for decentralised energy and district heating or cooling networks. Where appropriate, S106 agreements will be used to secure connection to existing or planned decentralised energy networks or the installation of CHP/CCHP on a site wide basis. Where this is not currently practical, developments will be expected to be 'future proofed' to facilitate connection to a future decentralised energy network and/or a financial contribution may be sought towards the development of that network"*[61].

5.4.4 CIL and Regulation 123

It is recommended that further work is required to identify whether CIL is viable for the strategic development sites identified in the JAAP. CIL may still be useful for other sites where heat networks may be proposed in future, to secure a financial contribution towards the development of specified networks. The outputs from this study should be used to assess and calculate the infrastructure funding gap for district heating. The heat mapping outputs will also inform where CIL rates should be differentiated to focus on areas with the most district heating potential.

The Charging Schedule must then be accompanied by a Regulation 123 list which outlines the types of infrastructure that may be funded by CIL. This ensures that there is no duplication between CIL and other infrastructure payments such as Section 106. Several Local Authorities have already included district heating on their Regulation 123 list, including Leeds City Council[62] and Wakefield District Council[63], although competition with other infrastructure requirements may give priority to other types of infrastructure deemed as more important. It is recommended that each council considers if heat network infrastructure is of strategic importance to the region and if so, whether it should be included within a Regulation 123 list.

The forthcoming Housing Bill will contain measures to expedite planning permission for housing on brownfield sites. Whilst this is unlikely to go as far as giving full permitted development rights, it might make it more difficult to negotiate S106 agreements for those sites. The majority of possible development sites in the area are brownfield and are likely to come forward for housing. If viability results are positive, CIL could provide a better alternative for those locations, as well as offering an opportunity for pooling.

5.5 Using planning conditions to secure successful heat networks

There are several ways in which planning conditions can be used to secure the successful delivery of heat networks. The following are recommended:

Condition to ensure connection to an existing network / network under construction
Where connection to an existing network is viable, planning conditions can be used to ensure the connection is implemented, using the wording proposed in 5.4.1 part C above. This has been used successfully throughout London and within Exeter.

Determining whether it would be feasible and viable for a developer to **implement a site-wide heat network** or to connect the development to **an existing network or network under construction** should occur **before** planning permission has been granted and consequently it would not be necessary to include "if feasible or viable" within the wording for a planning condition. This assessment

[61] London Borough of Lambeth (2013) Draft revised S106 planning obligations SPD
https://www.lambeth.gov.uk/sites/default/files/Draft%20S106%20SPD%20Aug%202013.pdf
[62] Leeds City Council (2014) CIL Regulation 123 List
http://www.leeds.gov.uk/docs/CIL%20Regulation%20123%20List%20(April%2015).pdf
[63] Wakefield District Council (2015) CIL Regulation 123 List
http://www.wakefield.gov.uk/Documents/planning/planning-policy/community-infrastructure-levy/2015/CIL-draft-reg-123-list-july-2015.pdf

would be carried out by the developer before planning permission is granted and included within the Energy Statement submission.

Condition to require connection before a development has been occupied
Where it has been agreed that a development will connect to an existing network / network under construction, planning conditions can be used to require that the developer establishes a physical connection to the network before the development has been occupied. This has been used successfully throughout London and within Bristol.

> *"The developer shall install and commission a physical connection for each dwelling to the District Heating Facility before the development is occupied."*

Condition to require connection to future networks
Where it is has been agreed that a development will connect to a planned network in the future, planning conditions can be used to require that a developer provides provision for future connection.

> *"The developer shall use reasonable endeavours to connect all buildings within [insert development name here] to the District Heating Facility unless it can be demonstrated that it is not economically viable. The developer should recognise that the point at which economically viability can be demonstrated may arise in the future, for example, at the end of the economic life of a stand-alone CHP plant.*
>
> *A decision regarding network connection at this development should be made by [define cut-off date]. If at this time it is not possible to agree connection to the District Heating Facility, due to the network being incomplete, the Developer shall submit an Alternative Energy Strategy for agreement."*

This phrase "reasonable endeavours" has been taken from the London Plan and represents the fact that a condition to require connection to a planned network brings about an element of uncertainty, both from the point of view of the network operator and the developer. At the time of issuing such a planning condition, it would be unlikely that the network operator could supply the developer with exact details on the heat tariff structures or cost of connection. This would mean that the accuracy of the developer assessment of economic viability cannot be guaranteed.

The reality is that there would be an element of risk associated with the likelihood of future connection, and circumstances could arise which mean that it is not viable for the development to connect. For instance, the network route could change, meaning that the cost of connection is greater. Or the connected heat demand could decrease, meaning that the network operator has to ramp up the heat prices leading to uncompetitive prices.

There has been lots of discussion within the heat network industry regarding the legal enforceability of this type of planning condition. Some state that you can legally enforce connection but you cannot force a development to purchase heat. As highlighted, this is an uncertain and evolving policy and so we cannot guarantee the effectiveness of this type of planning condition.

However, to cite a recent example, Exeter City Council included a requirement for a development to connect to a planned heat network within a Section 106 agreement, stating that it must connect "unless it would unreasonably delay construction". This led to an issue where the developer decided to implement individual boiler solutions, arguing that the implementation of a heat network connection was going to take too long and the council was forced to take out an injunction on the developer. This dispute was recently settled in court and the judge ruled in the council's favour. The development has now been connected to the network.

How should evidence be submitted and assessed?
Energy Statements for Strategic Developments and Developments located within proximity to an identified heat network should demonstrate and quantify how the development will comply with the heating and cooling hierarchy. Brighton and Hove City Council and Adur District Council should aim to work proactively with applicants on major developments to ensure these requirements can be met.

Developers should assess viability of district heating in line with industry best practice as outlined in Section 2 of the CIBSE Heat Networks Code of Practice. The standard parameter to assess the viability of a district heating network is the linear heat density. This is defined as the ratio of the annual heat delivered to the total length of the district heating piping and network. District heating networks are considered to be more viable if the linear heat densities are higher. The greater the dwelling density, the less sensitive the relative heat distribution loss is to linear heat density.

Viability assessment should also include the expected heat loads across potential residential and non-residential connections and detailed evidence across the site to determine if there are areas within it that have the right blend to give load diversity and heat density. Economic assessment should compare the cost of district heating against a baseline or "Business As Usual" scenario and produce cash flow statements including the Internal Rate of Return.

As discussed previously, it is recommended that Brighton and Hove City Council and Adur District Council make provision for compliance checking to determine whether 'future-proofing' measures have been implemented as required. Crawley Borough Council are exploring whether compliance checking could be delivered with developer contributions.

5.6 Working with developers

The following section considers how Local Authorities can engage with developers to promote connection to district energy networks.

5.6.1 Advice for developer negotiations

Local Authorities should focus on building a positive evidence base, using the Heat Mapping, Energy Masterplanning Study and any future techno-economic feasibility studies to demonstrate to a developer that connection to / or construction of a district heat network is technically and financially viable in the local context.

Before beginning discussions with a developer it is important to understand the developer business model - different developers will use different forms of financing from different sources and some will take a longer / shorter term interest in the development. If possible, also find out who their tenants will be - some developers are realising that heat network connection can help them meet the carbon targets of some high-profile tenants to whom they wish to sell or lease space.

Where developers seek to further investigate the viability of a district heating scheme in their energy statement submission, it should be ensured that testing has been carried out to industry best practice as outlined in Section 2 of the CIBSE Heat Networks Code of Practice. Developers tend to prefer to discount district heating using the technical and consumer argument rather than viability.

Considering advantages beyond cheaper heat or power can also pay dividends in making a developer more willing to engage. For instance:

- Focussing on the reputational benefits that connection to a low-carbon district heat network will interest some developers more than others
- Connection to a district heat network removes the need for individual gas boilers and large plant rooms as heat is provided to a building through a Heat Interface Unit which requires less space. The space gains translate to real financial gains for the developer, who can make use of the additional lettable space.
- A developer can collaborate with an Energy Services Company (ESCo) to implement site-wide district heating. This could enable the developer to offload a proportion of capital costs for heating / cooling plant to the ESCo, who will be incentivised to contribute capital because of the return on investment through the sale of heat.
- Depending on the carbon content of the heat provided, connection to a heat network can provide a lower cost way of meeting carbon reduction targets than the equivalent deployment of microrenewables. The UK is committed to reducing carbon dioxide emissions by 60% by 2050 from 1990 levels, with at least a 34% reduction to be achieved by 2020. The UK is also targeted to achieve 15% of its energy consumption from renewable sources by 2020.

However, planners should note that when only future-proofing measures are required then connection to a future network is not guaranteed. Also, depending on contractual requirements, some buildings may choose to disconnect in future.

5.7 Additional recommendations

The Carbon Trust have been advised that the capacity for the planning authorities to work closely with developers is reducing and that there is little resource to do the type of proactive best practice engagement described above. As a result there needs to be other mechanisms in place to deliver this activity.

It is therefore recommended that consideration is given to the potential for additional resource from with the authorities to support engagement with developers on district heat. This resource would require capabilities that span technical and planning disciplines. In the event that a network is operated by an ESCo, the local authorities could require that this resource is be built into the ESCo's remit.

6 CONTRACTING MODELS AND GOVERNANCE

There are a range of contracting models in the UK district heating market. Some companies may offer the full spectrum of the DBOOM set of roles (design, build, own, operate, and maintain) while others may specialise only in offering subsets of those services under contract.

Works include scheme design, energy centre installation, network construction and connection of premises, all of which need to be financed. Services include energy purchase, generation, O&M, metering and billing and customer service and management. Property agreements include sale or lease of operational land and buildings, easements and wayleaves.

The spectrum of possible structures runs from individual contracts for each of the elements listed above to a bundle of services and works procured under a comprehensive agreement. The following section provides an introduction to the most relevant opportunities potentially available. Four models have been introduced and explored: LA ownership; Special Purpose Vehicles; Joint Ventures; and Private Sector ownership. This covers the range of options that are currently available, but there are many variations within each and this requires further consideration at the feasibility stage.

6.1 Finance, Design, Build and Operate (DBO)

Under this arrangement the developer (potentially EGP or the project partners) would appoint a single contractor to finance, design, build, operate and supply wholesale heat and electricity to the network. The contractor has full liability for the provision of heat and power to the network. A heat supply company (that could include the public sector partners) would then buy this heat from EGP, or a contracting partner and sell it to consumers. The price at which heat will be supplied, given the required level of availability and standards of performance, is the key commercial consideration on which procurement would be focussed. The time taken in negotiating this and the associated Service Level Agreements should not be underestimated.

Where the DBO contractor finances the design and installation of the project the contract period would normally be in excess of twenty-five years, so that this initial investment can be paid back. The length of this contract is often determined by the available project returns, as determined in the financial viability assessment. At the end of the contract, the assets would normally be handed over to the sponsor.

Given that the public sector partners recognise the reputational risk around pricing, this model could reduce this risk. If a partnership could be formed with EGP then the public sector partners could also have more influence over the supplied heat price and the end cost to the consumer. If customers believe that the public sector partners carry influence over the scheme then this model gives them more control over customer pricing and indexation.

6.2 Public sector ownership of network, but with outsourced network delivery and operation

In this model the public sector remains the asset owner and contracts to supply heat to consumers. The build and operation is outsourced, with design either completed by consultants or included in the contractor package.

The main strengths of this approach are that it can make the best use of the Public Sector's access either to lower cost capital, it allows the public sector to retain control over customer prices and service and allows the strategic development of the scheme in future years.

In this arrangement the public sector takes the majority of operating risk of the service. The owner may also retain responsibility for new connections and the expansion of the network, though these functions could also be assigned to the contractor. Risk associated with appropriate design and operation of the system is carried by the supplier.

This is a particularly attractive model where a significant amount of the demand comes from public sector buildings. This however, is not the case in this project and, given the tentativeness across the public sector project partners to invest directly is unlikely to be a preferred business model.

6.3 Energy Services Company (ESCo)

If the public sector does not wish to own or operate a district energy scheme then a specialist service provider can bring expertise and risk management services to deliver the scheme.

Energy Service Companies (ESCos) are private companies, which provide varying levels of input to District Heating/CHP schemes and other types of energy service contracts. Typically, these services include project design, capital finance, construction, management, fuel purchasing, billing, plant operation, maintenance, long-term plant replacement and risk management.

ESCo arrangements work where an organisation is seeking to deliver the project for the lowest possible capital cost. The ESCo could potentially finance the Energy Centre plant and network and recover this investment by owning and operating the scheme under long-term energy supply contracts with consumers. The ESCo would be responsible for the performance and operation of the plant, for all maintenance and for any capital replacement costs over the term of the contract. Under this arrangement, the Whole Life Cost savings would essentially be shared between the ESCo and the consumers. The ESCo's element of the benefit is used for repayment of its initial investment and profit, whilst the consumers benefit is apparent through reduced energy costs.

An ESCo will seek a return on its investment that is generally far in excess of that of the public sector (>10% IRR). As this return on investment is unlikely to be available for the Shoreham heat network the ESCo will expect a capital contribution to meet this shortfall. In addition, the public sector partners may have little influence over the pricing across the scheme unless upfront contractual agreements are made. Adur Homes recognise this as a significant risk to their residents, particularly those that are more vulnerable. Where pricing caps are agreed these will be at the cost of having to manage other project risks such as demand security. The project partners will need to consider this relative cost and risk transfer throughout the negotiation process.

6.4 Procurement

The iterative process of determining the best blend of financial structure, technical design and operation, and ownership of the scheme will inform the procurement process and will be dependent on the partner's appetite for risk and reward.

Most public sector district energy schemes are subject to OJEU procurement processes, whether they are procured as a service or through capital expenditure. The capital expenditure associated with this scheme and service investment would take this project well over the works or services threshold irrelevant of the delivery model chosen[64].

The procurement route will depend upon the business model selected and additional work would be required based on the ownership model chosen. Should the partners choose to pursue an ESCo model then it may not be necessary to carry out detailed scheme design, however the negotiating position of the partners can be improved through developing the outline design and capital costs. The negotiation period with an ESCo can be significant, often 2 years or more, and will require the appointment of specialist advisors in OJEU procurement, legal and technical advice. Often the chosen procurement procedure is via competitive dialogue or negotiated procedure.

If a public sector / public-private SPV ownership model is pursued then the scheme can be consultant designed or packaged as part of a design and build contract. Each carries its own risk and benefits and these will need to be carefully considered in developing a procurement strategy. The Carbon Trust would only advise pursuing the consultant led approach for smaller, cluster schemes due to the project development costs involved. Often the chosen procurement route here is open or restricted tender.

[64] The Your Energy Sussex OJEU procurement has identified Carillion as a delivery partner and this may be considered as a procurement route.

If the DBO route is pursued then the contractor will need to appoint a technical advisor to develop the outline design, assess risks such as utility connections, structural and geotechnical surveys, planning building control and other consents, noise / vibration / air quality / environmental issues. They would then be required to develop detailed performance specifications and tender documentation for construction, O&M and billing services. The DBO contractor would then carry out due diligence and implement their own design. It would be the responsibility of the project partners, supported by the technical advisor, to ensure that the scheme delivered on the specification.

Should the project partners wish to break the scheme down into discrete packages, such as network design, energy centre design and customer interfaces then a consultant could be employed to design the scheme and a contractor(s) employed to implement this design.

Given that the Design and Build and Operation and Maintenance contracts may be procured separately it can be beneficial to appoint the same contractor for both. It should be noted however that whereas an ESCo and a DBO contractor can be penalised for poor performance, an O&M contractor will not normally be willing to accept contracts with penalty clauses. The contract value is usually too small for the risk of being penalised to be covered by prospective revenues under the contract, and the assignment of responsibility for service failure is likely to be disputed.

6.5 Conclusions

The project partners have a number of options to consider and these include doing nothing, playing a supporting and facilitating role and/or exploring development of a public private partnership (working with EGP and/or other private sector partners).

As the options considered are high risk propositions and the high level financial cases for the phase 1 schemes have IRRs of <10%, this would restrict financing opportunities and development opportunities. Networks are only likely to be a viable proposition if developed by, or with financial support from EGPS, with a grant, or with a mix of grant funding and public sector borrowing.

At this early stage it appears the most likely scenario for development occurs where EGPS is built and EGP drive, finance or incentivise the installation of a large network in order to receive the benefits associated with achieving certification as Good Quality CHP. In these circumstances the project may be developed via a DBO or ESCo route.

The project partners may undertake a series of corporate actions to promote and enable the scheme (see Chapter 7).

7 CONCLUSIONS

This report is a key deliverable of the Shoreham Harbour Heat Network Study. The district energy network options assessed have the potential to reduce energy costs (business model dependant), reduce carbon emissions, generate revenue (business model dependant), promote development opportunities and help alleviate fuel poverty in the immediate area.

Data collection and review
Building energy data and other relevant information was collected from the project partners, other stakeholders and mapping data bases. A low number of responses were received from potential heat loads in the private sector and historical energy data was not available for Adur Homes.

Energy demand assessment
The majority of heat demands are located to the north of the River Adur and canal basin and the planned developments along the Western Harbour Arm have the highest potential heat density. In other areas there is a relatively low linear heat density as many of the heat demands are relatively small and potentially inconsistent.

Summary of priority scheme and network
A number of network phases were selected for feasibility assessment and technologies identified for further consideration as heat sources for various network options included EGPS, marine source heat pumps, biomass heat, gas CHP and biofuel CHP.

Potentially viable network options were identified and more detailed viability assessments undertaken. A summary of network options and high level financial cases is provided in Table 56.

Table 56: Network options summary and high level financial cases for network options

Scenario	Phase	Energy source	Network trench length	Total heat demand	Estimated capital costs	25 year financial case			Annual carbon saving	CAPEX per carbon saving	CAPEX per MWh
						Payback	IRR	NPV			
A	1	EGPS	12.5 km	57,003 MWh	£18,289,822	13 years	7%	£8,271,631	11,106 tonnes	£1,647/tonne	£321 /MWh
	2		19.5 km	92,405 MWh	£28,351,373	13 years	7%	£15,197,019	17,999 tonnes	£1,575/tonne	£307 /MWh
	3		29 km	133,143 MWh	£38,994,806	13 years	7%	£20,925,870	24,909 tonnes	£1,565/tonne	£293 /MWh
B	1a	Gas CHP	1.7 km	17,306 MWh	£5,027,405	12 years	8%	£3,393,328	3,700 tonnes	£1,359/tonne	£291 /MWh
	1b	Biofuels CHP	6.4 km	32,296 MWh	£8,869,164	11 years	9%	£6,798,594	6,459 tonnes	£1,373/tonne	£275 /MWh
	2		7.3 km	48,581 MWh	£9,856,177	8 years	13%	£14,855,413	10,724 tonnes	£919/tonne	£203 /MWh
	3		13 km	71,699 MWh	£17,352,885	10 years	10%	£17,352,885	14,364 tonnes	£1,208/tonne	£242 /MWh
	4		21 km	106,975 MWh	£26,746,217	11 years	9%	£23,032,923	20,500 tonnes	£,1305/tonne	£250 /MWh

As private sector developers would require IRRs greater than 10% options are only likely to be viable if developed by, or with financial support from EGPS, with a grant, or with a mix of grant funding and public sector borrowing.

Sensitivity and risk
Table 57 summarises the key sensitivity parameters and risks for the selected network options.

Table 57: Key sensitivity parameters and risks

Scenario	Phase	Key sensitivity parameters	Key risks
All	All	• Heat demand • Capital cost • Price of heat sales	• Connection risk (existing or planned buildings not connecting) • Low linear heat density (associated with dispersed heat loads) • Availability of land for energy centre(s) • Changes to planned developments or developments not coming forward • Unsuccessful engagement with developers • Increases in capital cost • Some existing social housing does not incorporate communal wet heating systems / cost and disruption of retrofit • Difficulties and increased costs encountered when installing network due to groundwater and contaminated land issues • Low cost, low carbon heat from EGPS not being used if a network is not developed
Scenario A	1, 2 & 3	• Heat offtake price	• EGPS not being built • Prohibitive heat offtake price • Accessing the tunnel beneath the Port canal • Difficulties encountered in network crossing physical barriers such as the railway line and A259 • Difficulty securing gas supplies for peak and reserve boilers if located on Port site
Scenario B	1a	• Natural gas tariff • Electricity demand • Value of electricity sales	• Changes to energy tariffs • Increases in capital cost • Difficulty securing private wire arrangements with private sector residential developments
	1b, 2, 3 & 4	• Heat offtake price	• Biofuels CHP developer does not come forward • Prohibitive biofuel CHP heat offtake costs • Difficulties encountered in network crossing physical barriers such as the railway line and A259 • Difficulty securing gas supplies for peak and reserve boilers if located on Port site

Connection and heat demand risk
For both scenarios, reductions in total heat demand of between 17% and 50% reduce IRRs to below 5% and are likely to make the options unviable. The key heat loads for both network scenarios are Western Harbour Arm developments (stage 1), Adur Civic Centre redevelopment and King Alfred Development. Figure 64 quantifies these key heat demands and their impact on the financial viability of the network phases.

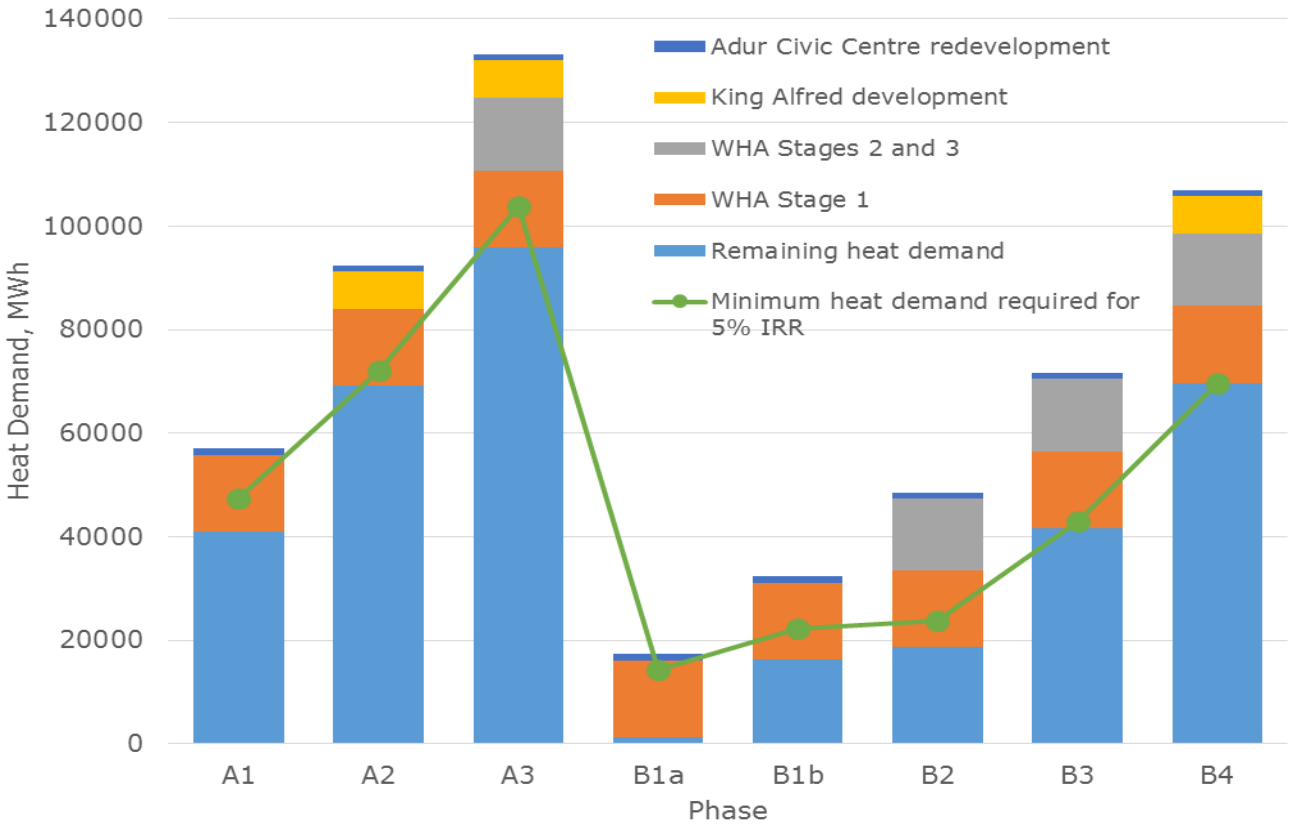


Figure 64: Summary of priority heat demands and their impact on the financial viability of network options

Figure 64 clearly illustrates that connection to the planned development in Western Harbour Arm is essential to provide the heat demand for a viable heat network. The network options are unlikely to be viable if the Western Harbour Arm development does not come forward or connect.

As the key heat demands are planned private sector developments there are very high associated connection risks relating to phasing of both developments and networks and engagement with developers. Successful engagement with the developers of these sites will be essential to mitigate this risk and the information included in this report can be utilised to clearly communicate the key benefits of district energy networks to potential developers. This study provides some of the initial high level information to begin assessing the business case for a developer to connect to a network, but further work is required at the techno-economic feasibility stage to gather more detailed information and assess the business case for developer connections.

After discussion with project partners and a review of development plans it is evident that resource is required to ensure that developers fully consider and prepare for district heating opportunities and that the potential for connection is set out in development briefs.

Potential changes to planned developments, and the associated energy demands, may have a significant impact upon network viability and phasing and will increase overall project risk. Project partners should monitor the developments that are brought forward in order to quantify the impacts of any changes on the high level financial cases for the network options.

Many of the businesses approached to supply energy data did not respond or did not have data, and a small number indicated that they did not want to be involved. If a techno-economic feasibility study is to be progressed, then significant further work will be required to engage with the larger existing businesses. To drive engagement, surveys may need to be conducted to identify how network connections can be integrated and to further identify the likely benefits for customers to connect. The financial stability of the businesses will also be an important consideration in relation to connection risk.

Energy and asset data was not available for the Adur Homes portfolio, but it is likely that there are a mix of communal boilers, individual wet systems and electrical heating. A condition survey of Adur Homes' buildings will be completed by the end of 2015 and will require detailed consideration at the feasibility stage in order to further assess retrofit and connection costs, viability and benefits for the housing association and its residents.

Lower risk public sector heat networks are unviable due to the low linear heat density of the loads and the small scale of the potential networks (Appendix 3 – Public Sector Network Assessment).

Low linear heat demands
In areas of low linear heat density as many of the heat demands are relatively small and inconsistent and do not provide potential key heat loads for a heat network. Without key heat loads with consistent heat demand, network viability relies on scale i.e. a large number of small heat demands, which increases connection risk. To improve the viability of the network options presented, potential key anchor loads such as a woodfuel drying plant could be developed.

Heat offtake price
For scenario A phase 1, if offtake costs are increased by 100% over the assumed tariff then the option is likely to be unviable. As it is in the financial interest of EGPS to ensure that a network is developed and heat offtake will not significantly impact electricity generation, the likelihood of heat offtake price being prohibitive is low for senario A.

If scenario B phase 1b offtake costs are increased by 160% over the assumed tariff, then the option is likely to be unviable. As for EGPS, the development of a large heat network may have significant financial advantages for a biofuel CHP company[65]. However, heat offtake may increase costs and impact on plant electricity generation, potentially affecting financial viability. Detailed discussions over offtake cost will need to be held with any potential developer and useful heat offtake requirememements should be addressed as part of planning consent.

Heat sales tariff
The high level financial assessments assume that heat is sold to end users at 3.5p/kWh. This is a competitive average tariff based on information received from potential end users and considers current energy tariffs, cost of generation and type of customer. The tariff is relatively low compared to other schemes in the UK and allows for the competitive offer that is likely to be required in order to ensure successful connections.

Energy centre(s)
As there is a significant land requirement there may be more than one location for peak and reserve energy centres. Potential locations for peak and reserve gas boilers include the EGPS site and WSCC owned land near the A259.

There is currently only a single gas supply to the main Port area south of the A259 and this provides gas at high pressure to SPS. It has not been established if it is possible to access this supply and, if this project is progressed to the feasibility stage, discussions will need to take place with SPS. If an energy centre is to be located in the Port Authority area, then it will have to be clearly demonstrated as supporting port related activities. As the site is space constrained it may be preferable to locate peak and reserve plant on publically-owned land.

Physical barriers
Encountering and overcoming physical barriers to the network has the potential to lead to increased capital expenditure that may affect scheme viability. Barriers include the railway line, key utilities infrastructure, main roads (particularly the A259 for all phases), surface water drains, hard digging conditions and areas of non-Council owned land.

[65] CHPQA (Combined Heat & Power Quality Assurance) is a voluntary UK government scheme to encourage the development of Good Quality CHP Schemes. If a specified required quantity of useful heat can be provided to a heat network then CHPQA accreditation will allow EGP to claim: an uplift from 1.5 to 2 ROCs per MWh of output generation; Enhanced Capital Allowances (ECAs); exemption from the Climate Change Levy (CCL); and potential business rates exemptions.

This area will require further investigation at the feasibility stage, particularly regarding crossing the railway line where existing bridges and underpasses may be crowded with services. This could be a serious limiting factor for the connections to the north of the railway and gaining permission from Network Rail to install the pipes may prove to be a difficult process. Excavation of level crossings may prove difficult and negotiations will need to commence at the first possible opportunity.

The offtake of heat from EGPS is reliant upon gaining access to a tunnel beneath the canal currently leased by Scottish Power. EGP have an early form of agreement with Scottish Power potentially allowing them access to the tunnel for export of heat and electrical power. In the event that EGPS is not developed and another developer comes forward, this will require detailed consultation on the part of the developer.

Liaison with Local Authority Highways and Planning departments suggest that there are groundwater and contaminated land issues for areas of the pipe route. Contaminated land issues will require detailed assessment prior to the development of phase 1 networks and groundwater conditions may require pipework and joints to be further protected and insulated, potentially increasing costs. These issues have been considered in this study but will require detailed assessment at the project feasibility stage.

Pipe routes follow soft verges and pavements wherever possible and trenching costs allow for project management. The largest pipes (potentially up to DN400) would extend along the A259 and the associated trench width would be approximately 2.5m. In order to minimise transport disruption in this busy area, detailed further network route planning will be required in consultation with Highways departments.

Planning considerations

Planning policy and planning teams play a crucial role in the development of heat network projects. The technical and financial work undertaken will provide an evidence base for planning policy across the authority areas, including the Joint Area Action Plan (JAAP), Brighton and Hove City Plan Part Two and Adur Local Plan; and to support developer negotiations, drafting planning conditions, Section 106 Agreements and the Community Infrastructure Levy.

It is recommended that the project partners set local requirements for decentralised energy which relate to the potentially viable network options and development areas identified in this report. Planning authorities in Shoreham can require proposed developments to connect to a network where it exists, or for the development to be designed so that it can connect to a future network where there is a planned or identified network.

Development proposals should, as far as practicable, include or support the following:

- The incorporation of district heating systems
- The provision of connection points, and the space required, to facilitate future connection
- The installation of communal wet systems
- Providing routes and penetrations into new buildings to allow district heat pipe access into plant rooms
- Designing systems to operate at optimised flow and return water temperatures

Section 106 Agreements and the Community Infrastructure Levy have had limited application in a district heating context, and as such this mechanism in supporting heat network development is relatively untested.

To promote network development, Section 106 agreements may be utilised to[66]:

- Collect contributions towards heat network development
- Oblige developers to connect to an existing network / network under construction
- Oblige developers to connect to a planned network
- Future proof connections

[66] This is a relatively untested and evolving policy area.

It important that there is capacity from the planning authorities and project partners to work closely with developers to undertake proactive best practice engagement. Where this is not available, skills and capacity will need to be developed. In such a case, consideration should be given to securing additional resources with which to support engagement with developers on district heating. This resource would require both technical and planning capabilities.

Summary
All options considered are high risk propositions and, as the high level financial cases for the phase 1 schemes show IRRs of <10%, this would restrict financing opportunities. Options are only likely to be viable if developed by, or with financial support from EGPS, with a grant, or with a mix of grant funding and public sector borrowing.

EGPS could provide a significant opportunity to develop a large heat network that may have the potential to reduce energy costs and/or generate revenue (business model dependant), reduce carbon emissions, promote development opportunities and help alleviate fuel poverty in the area.

If EGPS is developed without an associated heat network, the local authorities may receive criticism and reputational damage for failing to facilitate a network coming forward if the potentially low carbon, low cost heat resource is perceived as being wasted.

The most likely scenario for development occurs where EGPS is built and EGP drive, finance or incentivise the installation of a large network in order to receive the benefits associated with achieving certification as Good Quality CHP.

The project partners may undertake a series of corporate actions to promote and enable the scheme including:
- Facilitating engagement between key stakeholders, such as site businesses and developers
- Provision of land for construction of peak and reserve energy centres and pipe routes
- Commitment to long term purchasing contracts with the network operator
- Engagement and support with planning consents and highways activities
- Encouraging heat intensive businesses (potential key anchor loads) to locate in the vicinity of EGPS
- Providing resource and financial assistance in delivering feasibility and design work

If EGPS is not built, there is a very high risk opportunity to develop the small scenario B phase 1a scheme though the low IRR and associated risk, will restrict private sector financing opportunities for the scheme. Therefore the scheme will only be a viable proposition with grant or a mix of grant funding and public sector borrowing. This is likely to be the only small, potentially viable scheme in the heat map area and may be attractive to local community energy groups with the proposed Sussex Energy Tariff providing the key to progressing the network.

If EGPS is not developed a biofuel CHP plant will provide the most likely source of low cost, low carbon heat for a larger network. The project partners may provide an enabling role to promote the site to other organisations, but until a company comes forward, developing a large network is unlikely to be viable.

8 NEXT STEPS AND RECOMMENDATIONS

The project partners should carefully consider the findings of this study and decide how best to support district energy developments. They have a number of options to consider and these include doing nothing, playing a supporting and facilitating role and/or exploring development of a public private partnership (working with EGP and/or other private sector partners).

This decision will be heavily influenced by news on the progression of EGPS. Detailed further discussion will need to be undertaken with EGP in order to receive updated technical, financial and project management information. The views of EGP on how, and by when, the heat network project will need to be progressed will be key to informing next steps.

8.1 Corporate actions

Local Authorities should undertake a series of corporate actions to promote and enable a potential scheme including:

- Facilitating engagement between key stakeholders, such as site businesses and developers
- Provision of land for construction of peak and reserve energy centres and pipe routes
- Commitment to long term purchasing contracts with the network operator
- Engagement and support with planning consents and highways activities
- Encouraging heat intensive businesses (potential key anchor loads) to locate in the vicinity of EGPS
- Providing resource and financial assistance in delivering feasibility and design work

8.2 Additional resource

Capacity should be made available by public sector project partners to work closely with developers. If district heat projects are progressed, resource should be allocated, or additional resource secured.

In the first instance, the project partners should discuss the viability of funding this resource both internally and with support from DECC. If the opportunity is deemed viable requirements of the role will need to be defined and a procurement route agreed.

8.3 Planning

Local Authorities should set local requirements for decentralised energy which relate to the potentially viable network options and development areas identified in this report. Planning authorities in Shoreham should require/encourage proposed developments to connect to a network where it exists, and for developments to be designed so that they can connect to a future network where there is a planned or identified network.

Planning recommendations include:

- Amending the JAAP, Adur Local Plan and B&H City Plan in line with the specific recommendations made in Chapter 5.
- If EGPS is developed, the project partners should set local requirements for decentralised energy which relate to the priority network identified in Scenario A.
- Planning authorities should require proposed developments to connect to a network where it exists, or for the development to be designed so that it can connect to a future network where a viable network is identified.
- District heating potential should be included in both the Adur and Brighton & Hove Infrastructure Delivery Plans and, where CIL is being adopted, in the Regulation 123 Charging Schedule.
- Safeguard energy centre locations and encourage heat intensive business to locate in the vicinity of EGPS.
- Consideration should be given to the use of Section 106 Agreements to: collect contributions for heat network schemes that are financially driven; oblige developers to connect to planned networks, existing networks and networks under construction; set specific technical requirements to enable connection; and futureproof connections to planned networks.
- Consideration should be given to securing additional planning resources with which to support development of district heating schemes and engagement with developers.

8.4 Summary of Recommendations

The table below summarises the recommendations made in this report.

Recommendation	Indicative timeline[67]
Project strategy	
1. Consider the findings of this study to decide how best to support district energy developments.	*Immediate*
2. Receive updated technical, financial and project management information from EGP in order to inform the above decision.	
3. If EGPS is to be developed the project partners should enable and support the development of a network utilising heat from EGPS.	
4. Set clear objectives on what the network is attempting to achieve, linked to corporate priorities, and ensure senior management support by effectively communicating the project benefits.	*Short term*
5. Set up an internal project steering group and look to allocate resource to adequately support the feasibility process.	
6. Once the development plan for EGPS is confirmed, in consultation with EGP, the project partners should develop a clear timescale of decisions that must be met in order to align with EGP's development plan.	*Immediate and short term*
Resource	
7. Provide mechanisms and capacity to support network delivery at strategic and officer levels e.g. extend or create a new Project Board for project delivery and ensure officer capacity is available to support project delivery. Capacity should be made available by public sector project partners to work closely with developers and, if district heat projects are progressed, additional resource should be secured.	*Short term*
8. Discuss the viability of funding additional resource both internally and with support from DECC or the Your Energy Sussex Partnership; if the opportunity is deemed viable requirements of the role will need to be defined and a procurement route agreed.	*Short term*
Corporate (public sector partners)	
9. Facilitate engagement between key stakeholders, such as site businesses and developers.	*Short term*
10. Provide resource and financial assistance in delivering feasibility and design work.	*Short and medium term*
11. If EGPS is not developed the public sector partners may provide an enabling role to promote the EGPS site to other biofuel CHP developers.	
12. Encourage heat intensive businesses to locate in the vicinity of EGPS.	*Short, medium and long term*

[67]

Indicative timeline	Project stage
Immediate	Prior to feasibility
Short term	During feasibility
Medium term	During detailed project development
Long term	During project delivery

13. Provide and/or secure land for construction of peak and reserve energy centres and pipe routes.	*Medium term*
14. Commit to long term purchasing contracts with the network operator.	
15. Engage with and support planning consents and highways activities.	
Project development	
16. Undertake detailed consultation with all potential developers and, in particular, those seeking to bring forward Western Harbour Arm developments (stage 1), Adur Civic Centre redevelopment, King Alfred Development and identify business cases for planned developments to connect to the network (from the developer's perspective).	*Immediate and as developments are brought forward*
17. Develop an external stakeholder engagement plan to support the project development process.	*Short term*
18. Undertake further stakeholder engagement exercises including: discussions with key heat load clients to obtain historical energy data, technical details and to gauge enthusiasm for the project.	
19. Update heating / cooling demand and supply assessment to include: an updated energy demand and supply assessment for the prioritised areas; detailed consideration of the condition/asset survey currently being undertaken on behalf of Adur Homes; and site surveys to assess the financial cases for existing key heat loads to connect.	
20. A concept design should be developed for peak and reserve energy centre and plant to include a review of recommended energy centre location(s), relevant general arrangements, specifications and indicative sizing for all key plant and equipment items.	
21. A concept design should be developed for the heat network to include a detailed network analysis, optimisation and design for the priority network incorporating concept drawings, process flow diagrams and GIS representations.	
22. The project partners and/or representatives should liaise with potential end-users to seek assurances for heat offtake.	
23. Conduct detailed investigation of physical barriers, particularly in relation to crossing the railway line, crossing/disrupting main roads and contaminated land and groundwater issues.	
24. Develop a detailed financial model to determine all relevant financing options, scheme costs and income for the scheme taken forward; this should involve developing a detailed 25 year and 40 year life cycle, discounted cash flow model.	
25. Explore options for raising further financial support through grants, HNDU (for further feasibility work), Government district energy capital investment grants[68], European Regional Development Fund (ERDF), European Local Energy Assistance (ELENA) programme (for network development work), Your Energy Sussex, SALIX[69] and ECO (for connection and retrofit works to public sector buildings).	
26. Develop an implementation programme and phasing plan to include an investment timeline and delivery plan.	
Planning	
27. The JAAP, Adur Local Plan and B&H City Plan should be amended in line with the specific recommendations made in this report.	*Short term*
28. If EGPS is developed, it is recommended that the project partners set local requirements for decentralised energy which relate to the priority network identified in Scenario A.	

[68] £300M announced at November spending review to bring forward 200 heat networks in England and Wales.
[69] Interest free loans for connection to existing district heating via plate HE and thermal stores.

29. Planning authorities should require proposed developments to connect to a network where it exists, or for the development to be designed so that it can connect to a future network where a viable network is identified.	
30. District heating potential should be included in both the Adur and Brighton & Hove Infrastructure Delivery Plans and where CIL is being adopted, in the Regulation 123 Charging Schedule.	
31. Consideration should be given to the use of Section 106 Agreements to: collect contributions for heat network schemes; oblige developers to connect to planned networks, existing networks and networks under construction; set specific technical requirements to enable connection; and futureproof connections to planned networks. 32.	
33. Consideration should be given to securing additional planning resources with which to support development of district heating schemes and engagement with developers.	
34. Safeguard energy centre locations and encourage heat intensive business to locate in the vicinity of EGPS.	*Short, medium and long term*

8.5 Shoreham Harbour Heat Network Project Development Process

The following section describes the development process for a potential district heating project in the Shoreham area.

8.5.1 Summary

District heating schemes should be focussed on the needs of the customer and the objectives of local authorities in supporting district heating in their areas. Table 58 below summarises the steps required to implement a district heating project in Shoreham and Figure 65 relates this to potential DECC HNDU support.

To progress the Shoreham Heat Network it will be important to extend or create a new Project Board to take the work to the next stage. This board will consider the project development process and ensure that the relevant internal stakeholders are engaged at this stage. It is also important to understand the resource implications of undertaking a project of this scale and ambition. This section describes specific commercial models and considers the capacity and skills available to the project partners to manage the development and procurement process.

If EGPS is developed the potentially viable phase 1 network may meet a range of project partner objectives. The consultant team facilitated early discussion of objectives with the project partners amongst whom there is consensus that reducing energy costs to residents and business is a priority[70]. At this stage there has not been detailed discussion on the link between project objectives and combined corporate priorities. The determination of these objectives will inform the role of the project partners in network development. There may be interest from the private sector (including EGP) in owning and/or operating a district heating network in Shoreham, and the project partners should give full consideration to the risks that this may present. These risks include reputational risks that arise from being associated with a network over which the public sector partners may not have significant control.

During facilitated discussion, the project partners considered potential delivery models for a Shoreham Heat Network. It was indicated that there was likely to be insufficient funding and resource available to develop a public sector owned network and the preferred model would require an element of private sector finance.

[70] This will need to be the case in order to secure the connections required to make the project viable.

It is possible that a public sector led company, or Special Purpose Vehicle (SPV), could own and/or manage district heating in Shoreham. This will be particularly important if minimising and controlling heat prices to residents remains a clear priority. However given LA borrowing constraints and development timescales, the project team should investigate the creation of a company that can accept finance from private sector partners.

EGP must export heat from their facility to a heat network recognised under the CHP Quality Assurance scheme (CHPQA) to qualify for fiscal incentives (ROC uplifts) critical to their business plan. Therefore there is a clear incentive for EGP to support the development of a heat network scheme. EGP may be interested in developing the network themselves, or as part of an SPV, and a public-private partnership could be investigated[71].

In parallel with the investigation of a potential collaboration between EGP and the public sector, the project partners may wish to carry out market testing activity to look at other business models and partnerships. There is significant expertise across the project partners to realise this vision, but the capacity, time and investment implications should not be underestimated.

[71] There may be a profit-sharing incentive and an agreed heat offtake price.

Table 58: The steps for developing district heating projects

Development Stages	HNDU stages	Status		Next Steps
Opportunities Identification and Appraisal	Mapping	First phase complete.		Ensure the link between the identified opportunities and the project partners overarching objectives is clearly articulated and continues to inform the project development (see mobilisation below).
Mobilisation	Pre-feasibility and masterplanning	Some internal engagement was undertaken as part of heat mapping exercise, including consideration of project drivers and council objectives. Results have been captured in the stakeholder engagement questionnaires.		Set clear objectives on what the scheme is attempting to achieve, linked to corporate priorities, and ensure senior management support by effectively communicating the project benefits. Set up an internal project steering group and look to allocate resource to adequately support the feasibility process.
High Level feasibility / Energy Masterplanning		Heat mapping has been completed and opportunities have been prioritised.		The most viable opportunities have been prioritised and should now be refined through external engagement with heat customers and heat sources.
Engagement	Feasibility	Limited external engagement has taken place.		Develop an external stakeholder engagement plan to support the project development process. Ensure that the relevant elements of the feasibility study are provided to key stakeholders - including heat customers and heat sources - in an understandable and relevant format. Tailor the information to the needs of the audience - avoid generic communications at this stage. Begin to explore the motivators and barriers for potential heat suppliers and heat customers and use this to inform the masterplanning.

Development Stages	HNDU stages	Status		Next Steps
Technical Feasibility	Feasibility	Following masterplanning, further detail will be required on scheme design, operational philosophy and network layout.	Iterative process	A suitably qualified specialist District Heating engineering consultancy should be appointed to develop the project such that capital costs can be clearly understood, connecting customers have a clear business case for connection and the scheme design is taken through to outline design giving consideration to future proofing and network growth.
Financial Viability		Detailed cash flows need to be established to provide confidence to investors and determine the preferred business model.		A financial specialist will need to be appointed to determine the treatment of tax, the blend of finance, carry out sensitivity analysis and develop a detailed cash flow for the company managing the scheme.
Business Model and Governance	Procurement of delivery mechanism	Requirement to determine ownership structure and contracting structures. These need to be linked with financial viability and the objectives of the scheme set out in the mobilisation phase.		Asset ownership and service provision needs to be unpacked and properly understood so that risk can be mitigated and managed in both construction and operation. Contracts for consumers, supply licensing arrangements, liability and outsourced services to be determined at this stage.
Procurement	Commercial development	Requirement to determine which elements of the Design, Build, Own, Operate, and Maintain elements will be outsourced. Soft market testing to explore market options and delivery partners and creation of procurement pack.		The procurement strategy will need to be established and this will be linked to the business model and financial viability exercises. If the ownership is to be outsourced then the procurement strategy is likely to be Design, Build, Own, Operate and Maintain (DBOOM) which will require the appointment of a commercial and technical advisor. If the Council wishes to have part/complete ownership then the delivery options become significantly broader, where network components can be packaged and procured separately.
Construction	Construction	Appoint construction/contract manager and determine external support required.		Appoint CDM co-ordinator and clerk of works. Project Manager responsible for contract administration, meeting environmental and planning requirements and cost management.

Development Stages	HNDU stages	Status		Next Steps
Operation and Maintenance	Operation and Optimisation	O&M, metering and billing strategy informed by earlier business model choice.		Set up O&M contracts with incentives. Determine the requirement for a specialist firm for metering and billing or whether this will be managed in house. Set up customer charter and manage communications with connecting customers.

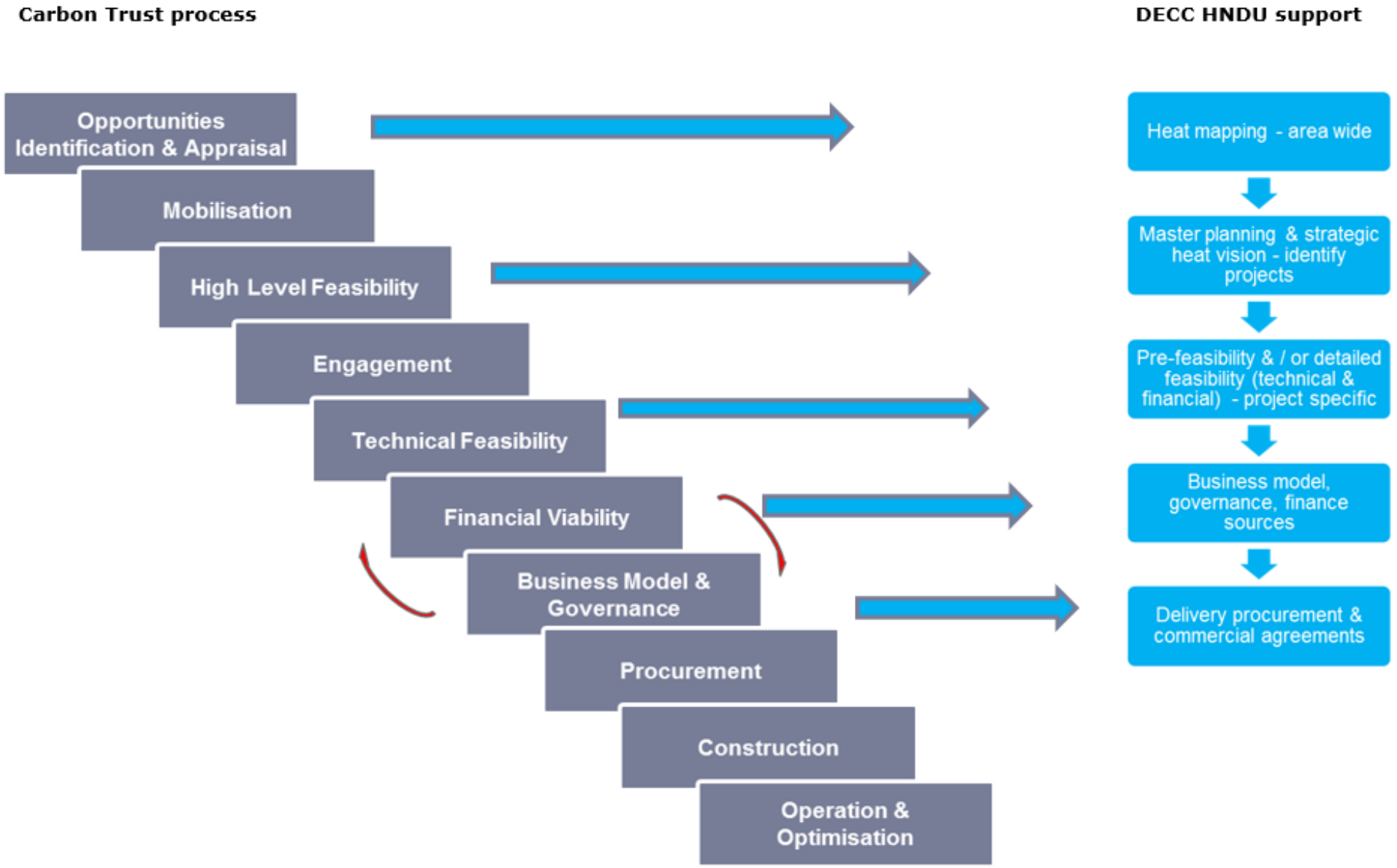


Figure 65: Heat network development process and HNDU support

8.5.2 Mobilisation

While some senior stakeholders and decision makers have been involved in this process, it is important that the profile of the project is now raised, given there is greater definition to the scope and size of the network. It is important that the broader vision (to be agreed by the project partners) is articulated and that the project is linked to the corporate objectives of the project partners. This will help to ensure that the project delivers on the social, environmental and economic ambitions of the partners.

Furthermore, the project board could be extended, or a project board to explore delivery be established. Legal and finance functions will become an essential element of the board. Individuals from key disciplines including finance, procurement, technical, legal and project management (outlined below) should be engaged and consulted on their availability to support the project. Other departments that should be consulted include highways, planning, housing and facilities. It is important that the benefits and intended outcomes of the project are established and articulated so that everyone has a sound understanding of the implementation process and the intended outcomes.

Resource implications will include both internal staff time and resource budget. Accordingly, dedicated project management resource will be required and careful consideration should be given to creating an appointment incorporating relevant skills and knowledge (both technical and planning) or developing in house capacity to take forward a project of this nature.

8.5.3 Engagement

Many of the heat loads of buildings assessed for potential connection to a district heating scheme were verified using benchmarks. Where these loads are of particular strategic importance (e.g. Shoreham Academy and Southlands Hospital that drive the network extension to a new area) it is essential that more detailed information is captured to reduce risk in project economics and provide confidence to connecting customers that their heat demand has been modelled accurately. The project partners should review the stakeholder list and take ownership of these relationships.

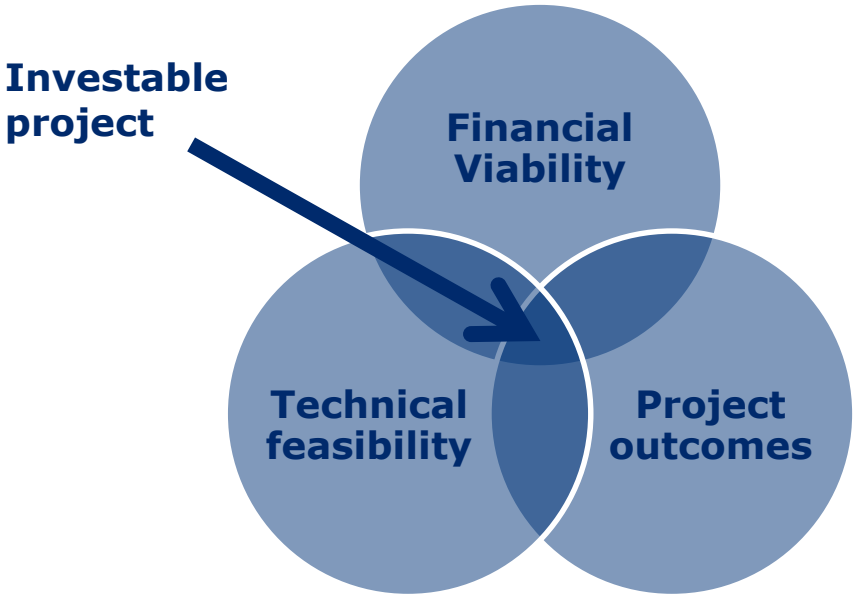
If a scheme is progressed, an informal marketing exercise for potential customers should be undertaken and regular communication maintained throughout the development process. Dependent on the in-house skills and resource, this may require the introduction of a specialist marketing / PR firm.

A significant part of the project development process will be in understanding and reducing the commercial risk to EGP and the other project partners. As stated, this will require collaboration with EGP to support the development of district heating through facilitation, provision of land or financial contribution. As project viability and design are dependent on heat supply from EGP, a Memoranda of Understanding (MoU) should be established to allow further investigation of heat supply arrangements, likely capital costs and heat prices.

In addition a MoU should be established with the owners of key heat loads as the first point of determining heat contracts. A MoU would allow for a study to be undertaken to determine a reasonable heat off-take price. This could be commissioned by EGP and audited by the Councils.

8.5.4 The technical, financial and legal project development cycle

There should be an iterative process in developing the best technical, financial and legal solution for the project. This requires the appointment of several specialists that will need to work in partnership to identify the most appropriate business model, governance structure and network design to deliver on the Local Authority objectives set out earlier in the process. The diagram below outlines how each element needs to be blended to ensure that the project is investable. This is particularly important where external funding may be required and investors will want to carry out due diligence on the project.



8.5.5 Technical Feasibility

This stage should be used to develop the existing techno-economic model for the scheme and to reduce uncertainty in the project around the network and energy centre costs and the available revenues. Once a revised techno-economic model with 25 and 40-year cash flows has been established the Council can build greater confidence in the delivery model and governance structures that are most likely to work for the project. The section below details the key steps required in removing uncertainty from the existing model and taking the project forward into financial viability.

Stakeholder engagement and updated heating / cooling demand and supply assessment
Discussions with potential stakeholder and key heat loads to obtain historical energy data and technical details and to gauge enthusiasm for the project. Other stakeholders include Network Rail, Highways Departments and Scottish Power.

Detailed consultation with the, as yet unidentified, developers of the Western Harbour Arm development (phase 1), Adur Civic Centre redevelopment and King Alfred Development.

When developers are identified, Local Authorities should develop a business case for connection to the network (from the developer's perspective) which could be used to encourage them to connect.

This will include an updated energy demand and supply assessment for the prioritised areas. This exercise should build upon the data previously collected and generated data.

Detailed consideration of the condition/asset survey currently being completed will need to be undertaken on behalf of Adur Homes in order to further assess connection costs, viability and benefits for the housing association and its residents.

Significant further work is needed to engage with the larger existing businesses, survey their buildings and assess financial cases for them to connect. The financial stability of the businesses will also be an important consideration in relation to connection risk.

Site Surveys
In order to confirm the feasibility of providing new services customers and the compatibility of their existing heating systems, the operators of each building should be contacted and site visits arranged to inspect:

- Whether the building uses a wet heating system (required for district heating);
- Operating temperatures and pressures;
- Age and size of heating plant; and,

- Feasibility of connection route (boiler room to main spine).
- Presence of accumulators in buildings
- The pressures required to reach each plant room
- Proposed building and plant upgrades and impact on heat load
- Time that system is in operation and control strategy employed

Network route
An indicative route for the buried pipe network required to interconnect the buildings has been developed with associated costs. If a scheme is to be taken forward it is necessary to further develop the network concept design, considering in greater detail the technical feasibility of connecting loads, customer temperature profiles and site topography. This should review current safeguarding proposals for future expansion in light of any changing assumptions on energy demand. This will also involve more detailed investigation into buried services, utility connections and potential multi-duct installation of district heating with other services.

Energy Centre size and location
The size and location of any peaking plant will be determined by the available heat offtake from EGPS and it is therefore of paramount importance that heat offtake supply and pricing is undertaken.

The initial high level planning for the energy centre options presented have been discussed, this should be re-visited and updated as the design progresses. These initial layouts should be assessed and revised in light of more detailed site investigations. A detailed cost plan must be produced to reflect the mechanical, structural, civil and electrical works required to deliver an energy centre at these locations. Site investigations should begin to investigate the:

- Planning feasibility investigation
- Utility connection investigation
- Existing plant rationalisation and reorganisation investigation

Financial viability
Moving from the initial energy masterplanning and viability assessment into a more detailed techno-economic model will provide the project partners with detailed financial outputs. This phase should build on the existing approach and financial outputs through refinement of the current assumptions via market testing, involvement of finance teams, updating with customer billing data etc. The project needs to be converted to an investment, assessing the full range of benefits and conducting detailed sensitivity analysis on each. The technical assessment should:

- Set heat prices that are based on current expenditure for connecting customers (includes plant efficiencies and maintenance), split between standing charges and a unit price
- Have agreed a heat offtake price from EGPS under the conditions of an MoU
- Understand environmental incentives and how connecting customers should realise these benefits
- Agree a method of forward price projection
- Complete sensitivity analysis around load reduction and price fluctuation
- Collate a schedule of capital costs required for the development and delivery of the project
- Collate a schedule of operational costs
- Collate a schedule of revenue income

Financial viability and Project Outcomes
The financial modelling should balance the original objectives of the project to deliver on the vision which could include: area-wide emissions reduction, encouraging developers to connect to heat networks, fuel poverty alleviation and reduced costs to residents, low cost heat and power to local businesses, generating a sustainable source of income and catalysing further heat network development.

A workshop was completed with the project team to assess the importance of each of these objectives. The workshop revealed that there are a range of different views on the relative importance of different objectives across the project team. It will be important to continue to consider these objectives and their interplay, whilst consulting with senior managers on linking in project objectives with the corporate strategy. There was general consensus that the following project objectives were of the greatest importance:

- Reduce energy costs
- Support economic growth
- Provide a sustainable source of income

These objectives will need to be assessed within the context of overall scheme viability, risk and preferred ownership. It is important to note that reducing energy costs and supporting economic growth may conflict with maximising income generation. Therefore these objectives will need to be balanced across the developing financial model. If reducing energy costs for residents and businesses are made a priority then these are likely to be delivered through public sector influence over the business model. If the project economics support subsidised heat prices to vulnerable residents or important businesses then these can be negotiated within a private sector model.

Financial viability and the business model

The financial viability process should be linked with the development of the business model and possible iterations to the technical detail of the project. If an SPV is to be developed a financial/commercial expert will need to be engaged to work with public sector finance teams.

As well as determining financial viability the financial model should be used to negotiate heat contracts and set heat sale rates for connecting customers. It is therefore essential that the project partners own the cash flow models and understand their operation.

In addition a financial expert will need to work closely with the legal team and a commercial expert to determine tax treatment and benefits, energy centre leasing arrangements, allocation of risk within the scheme, permitting and regulatory risks and debt collection arrangements.

It may be appropriate to undertake the financial modelling using a range of rates of return. Initial discussion suggested that there may be a lack of LA finance available and little appetite to borrow at this time. If this is the case it would mean that the project team should focus on other opportunities to have influence over scheme governance including facilitation, provision of anchor loads and land availability.

In-house skills

The Carbon Trust circulated a skills analysis assessment form across the project team and their colleagues. The skills analysis looked at experience across Adur-Worthing, WCSS and BHCC in legal, finance, procurement and project management expertise relating to district heating project development and project management[72].

It appears that, across the key areas of project development, there is some experience in district heating, energy or related projects. This would suggest that whilst capacity remains an issue there is considerable experience across the broader group of internal stakeholders to input on preferred commercial structures and delivery. These identified individuals should be further engaged to at least draw on their expertise and, where possible, a contribution of time. As a lack of delivery resource has been raised as a project risk it may be that individuals are only utilised in an advisory capacity, but their input could be invaluable, substantially reducing transaction costs and ensuring that the public sector partners retain influence over the project.

[72] This could be direct experience or related through similar projects in energy or infrastructure and the survey did not assess the availability of this resource.

APPENDIX 1 – BUILDING OWNERS CONTACTED

List of buildings where owners were contacted by SEL to request energy data.

Site ID	Building Name	Owner	Address	Postcode
1	Ricardo Industrial Building 1	Ricardo	Old Shoreham Road	BN43 5FG
2	Ricardo Industrial Building 2	Ricardo	Old Shoreham Road	BN43 5FG
3	Ricardo Industrial Building 3	Ricardo	Old Shoreham Road	BN43 5FG
4	Ricardo Industrial Building 4	Ricardo	Old Shoreham Road	BN43 5FG
5	Ricardo Industrial Building 5	Ricardo	Old Shoreham Road	BN43 5FG
6	Ricardo Industrial Building 6	Ricardo	Old Shoreham Road	BN43 5FG
7	Ricardo Industrial Building 7	Ricardo	Old Shoreham Road	BN43 5FG
8	Ricardo Industrial Building 8	Ricardo	Old Shoreham Road	BN43 5FG
9	Ricardo Offices 1	Ricardo	Old Shoreham Road	BN43 5FG
10	Ricardo Offices 2	Ricardo	Old Shoreham Road	BN43 5FG
11	Ricardo Offices 3	Ricardo	Old Shoreham Road	BN43 5FG
12	Ricardo Offices 4	Ricardo	Old Shoreham Road	BN43 5FG
13	Ricardo Offices 5	Ricardo	Old Shoreham Road	BN43 5FG
14	Ricardo Offices 6	Ricardo	Old Shoreham Road	BN43 5FG
33	Northbrook College Sussex	Northbrook College Sussex	Cecil Pashley Way	BN43 5FF
44	Tollbridge House	Adur Homes	Connaught Avenue	BN43 5WP
61	Aston House	Adur Homes	Freehold Street	BN43 5TQ
62	Buckingham Street, building 1	Adur Homes	Buckingham Street	BN43 5TB
63	Buckingham Street, building 2	Adur Homes	Buckingham Street	BN43 5TB
64	Buckingham Street, building 3	Adur Homes	Buckingham Street	BN43 5TB
65	Homehaven Court	Adur Homes	Swiss Gardens	BN43 5WH
66	Swiss Gardens Primary School	WSCC	Swiss Gardens	BN43 5WH
67	Ropetackle Arts and Business Centre	Ropetackle Arts and Business Centre	High Street	BN43 5DB
68	West Court	Adur Homes	West Court	BN43 5XF
69	White Lion Court	Adur Homes	Ship Street	BN43 5DY
71	Coop, High Street	The Cooperative	High Street	BN43 5DA
72	Shoreham Centre, Community Centre	ADC	Pond Road	BN43 5WU
73	Shoreham Centre, Council Offices	ADC	Pond Road	BN43 5WU
76	Cecil Norris House	Adur Homes	Ravens Road	BN43 5AQ
77	St Paul's Lodge	Millstream Management	Southdown Road	BN43 5WT
78	Royal Mail Delivery Office	Royal Mail	Brunswick Road	BN43 5XD
79	Tarmount Lane, telephone exchange	British Telecom	Tarmount Lane	BN43 6DA
80	Police Station	Other public sector	Ham Road	BN43 6PA
82	Coop, Ham Road	The Cooperative	Ham Road	BN43 6PA
83	Pashley Court	Adur Homes	Ham Road	BN43 6PA
102	Palace Drinks, Alcohol Wholesaler	Palace Drinks	Gordon Road	BN43 6PA
106	Paladone	Paladone	Brighton Road	BN43 6RN
107	Rosslyn Court, building 1	Adur Homes	Rosslyn Court	BN43 6WL
108	Rosslyn Court, building 2	Adur Homes	Rosslyn Court	BN43 6WL
109	Rosslyn Court, building 3	Adur Homes	Rosslyn Court	BN43 6WL
110	Buckingham Park Primary School	WSCC	Hamfield Avenue	BN43 5TY
111	Fairlawns, building 1	Adur Homes	Fairlawns	BN43 6BW
112	Fairlawns, building 2	Adur Homes	Fairlawns	BN43 6BW
113	Fairlawns, building 3	Adur Homes	Fairlawns	BN43 6BW
114	Fairlawns, building 4	Adur Homes	Fairlawns	BN43 6BW
115	Fairlawns, building 5	Adur Homes	Fairlawns	BN43 6BW

Site ID	Building Name	Owner	Address	Postcode
116	St Nicolas and St Mary Primary School	WSCC	Eastern Avenue	BN43 6PE
118	St Peters Roman Catholic Primary School	WSCC	Sullington Way	BN43 6PJ
120	Southlands Hospital	Other public sector	Upper Shoreham Road	BN43 6TQ
121	Elmcroft Care Home	WSCC	St Giles Close	BN43 6AT
122	Beeding Court	Adur Homes	St Giles Close	BN43 6GR
123	Bramber Court	Adur Homes	St Giles Close	BN43 6GR
124	Sompting Court	Adur Homes	St Giles Close	BN43 6GR
125	Southlands Court	Adur Homes	St Giles Close	BN43 6GR
126	Kingston Buci Children & Family Centre	WSCC	St Giles Close	BN43 6GR
127	Cavell House Care Home	Larchwood Care Homes	Middle Road	BN43 6GS
128	Glebelands Day Hospital	WSCC	Kingsland Close	BN43 6NQ
129	Kingsland House Care Home	Barchester Healthcare	Kingsland Close	BN43 6LT
134	House of Hugo	House of Hugo	Dolphin Road	BN43 6PB
135	Gemini Press Printers	Gemini Press	Dolphin Way	BN3 6NZ
136	Gemini Press Warehouse	Gemini Press	Dolphin Way	BN3 6NZ
141	Edgars, Dolphin Enterprise Centre, A, 4 units	Edgars	Evershed Way	BN43 6NZ
142	DAF	Barnes DAF	Dolphin Road	BN43 6PB
145	Infinity Foods Coop	Infinity Foods Coop	Dolphin Road	BN43 6PB
146	VW Heritage	VW Heritage	Dolphin Road	BN43 6PB
147	Higgidy	Higgidy	Dolphin Road	BN43 6PB
148	Pyroban	Pyroban	Dolphin Road	BN43 6QG
152	B&Q	B&Q	Brighton Road	BN43 6RJ
154	Screw fix	Screw Fix	Brighton Road	BN43 6RJ
155	Howden's Joinery Co.	Howden's Joinery Co.	Brighton Road	BN43 6RJ
156	Travis Perkins Timber & Building Supplies	Travis Perkins Timber & Building Supplies	Brighton Road	BN43 6RJ
157	City Plumbing Supplies	City Plumbing Supplies	Brighton Road	BN43 6RJ
159	RNLI Lifeboat station	RNLI	Brighton Road	BN43 6RN
176	Shoreham Beach Primary School	WSCC	Shingle Road	BN43 5RH
181	Firestation	WSCC	Stoney Lane	BN43 6TB
182	Ambulance Station	Other public sector	Stoney Lane	BN43 6TB
183	Holmbush Shopping Centre, Tesco	Tesco	Upper Shoreham Road	BN43 6TD
184	Holmbush Shopping Centre, McDonalds	McDonalds	Upper Shoreham Road	BN43 6TD
185	Holmbush Shopping Centre, Marks & Spencer	Marks & Spencer	Upper Shoreham Road	BN43 6TD
186	Holmbush Primary School	WSCC	Hawkins Crescent	BN43 6TN
187	Herons Dale Primary School	WSCC	Hawkins Crescent	BN43 6TN
188	Next	Next	Upper Shoreham Road	BN43 6TD
189	Swimming Pool	Impulse Leisure	Kingston Broadway	BN43 6TE
190	Loney Court	Adur Homes	Wilmot Road	BN3 6BN
191	Fraser Court	Adur Homes	Buci Crescent	BN43 6LW
192	Milward Court	Southern Housing Group	Wilmot Road	BN43 6BU
193	Penstone Court	Adur Homes	Wilmot Road	BN43 6NJ
194	Julian Court	Adur Homes	Julian Court	BN43 6NG
195	Wilmot Court	Adur Homes	Wilmot Road	BN43 6NL
196	Osborne Court	Adur Homes	Wilmot Road	BN43 6NH
197	Holmbush Court	Adur Homes	Stoney Lane	BN43 6NB
198	Downes Court	Adur Homes	Wilmot Road	BN43 6NF
199	Adur Court	Adur Homes	Stoney Lane	BN43 6LY
200	Broadway Court	Adur Homes	Wilmot Road	BN43 6NE

Site ID	Building Name	Owner	Address	Postcode
201	Wiston Court	Adur Homes	Arundel Close	BN43 6LX
202	Arun Court	Adur Homes	Stoney Lane	BN43 6LZ
203	Arundel Court	Adur Homes	Arundel Close	BN43 6LR
204	Caius Court	Adur Homes	Stoney Lane	BN43 6NA
205	Kingston Court	Adur Homes	Stoney Lane	BN43 6ND
206	Shoreham Academy	United Learning	Kingston Lane	BN43 6YT
207	Shoreham College	Kennedy Independent School Trust Ltd	St Julian's Lane	BN43 6YW
208	Ashcroft Sheltered Housing	Adur Homes	Kingston Lane	BN43 6YU
209	Marsh House	Adur Homes	Park Lane	BN42 4DL
210	Glebe Primary School	WSCC	Church Lane	BN42 4GB
211	Kingsfield Close	Adur Homes	Kingsfield Close	BN42 4FU
212	The Green, building 1	Adur Homes	The Green	BN42 4FW
213	The Green, building 2	Adur Homes	The Green	BN42 4FW
214	The Green, building 3	Adur Homes	The Green	BN42 4FW
215	Hope Cottages	Adur Homes	Roman Crescent	BN42 4TZ
219	Dudman Aggregate	Dudman Group	Albion Street	BN42 4ED
220	Grange Industrial Estate, Coppard plant hire	Coppard Plant Hire	Albion Street	BN42 4EN
221	Grange Industrial Estate, Southover Food Company	Southover Food Company	Albion Street	BN42 4EN
222	Grange Industrial Estate, The Tile Source, Showroom	The Tile Showroom	Albion Street	BN42 4EN
223	Grange Industrial Estate, Eyre & Elliston, Electrical Distributors	Eyre & Elliston	Albion Street	BN42 4EN
224	Grange Industrial Estate, Wemoto, motorcycle parts	Wemoto	Albion Street	BN42 4EN
225	Grange Industrial Estate, Optimum Kitchen Appliance Centre	Optimum Kitchen Appliances	Albion Street	BN42 4EN
226	Wyndeham Grange, Printers	Wyndeham Group	Grange Road	BN42 4DQ
227	Wyndeham Grange Press Offices	Wyndeham Group	Grange Road	BN42 4DQ
228	Locks Court	Adur Homes	Butts Road	BN42 4DS
229	Grange Court	Adur Homes	Butts Road	BN42 4DS
230	Coates Court, building 1	Adur Homes	Butts Road	BN42 4DS
231	Coates Court, building 2	Adur Homes	Butts Road	BN42 4DS
232	Coates Court, building 3	Adur Homes	Butts Road	BN42 4DS
233	Watling Court, building 2	Adur Homes	Butts Road	BN42 4DS
234	Watling Court, building 1	Adur Homes	Butts Road	BN42 4DS
235	Spring Gardens	Adur Homes	Whiterock Place	BN42 4AG
236	Rock Close, building 2	Adur Homes	Whiterock Place	BN42 4AG
237	Rock Close, building 1	Adur Homes	Whiterock Place	BN42 4AG
238	Channel View	Adur Homes	Whiterock Place	BN42 4AG
239	Sea House	Adur Homes	Whiterock Place	BN42 4AG
240	Harbour Court	Adur Homes	Whiterock Place	BN42 4AG
241	Albion House	Adur Homes	Whiterock Place	BN42 4AG
242	Dudman Offices	Dudman Group	Albion Street	BN42 4ED
243	Nautilus House, Port Authority Offices	Port Authority	Albion Street	BN42 4ED
248	Southwick Library	WSCC	Southdown Road	BN42 4FT
249	Southwick Community Association	Southwick Community Association	Southwick Street	BN42 4TE
250	Eastbrook Primary Academy (North site)	WSCC	Manor Hall Road	BN42 4NF
251	Leisure Centre	Impulse Leisure	Old Barn Way	BN42 4NT

Site ID	Building Name	Owner	Address	Postcode
252	Indoor Bowling Club	Adur Indoor Bowling Club	Old Barn Way	BN42 4NT
253	Lewis Court	Adur Homes	Old Barn Way	BN42 4NS
254	Manor Court	Adur Homes	Old Barn Way	BN42 4NS
255	Barn Court	Adur Homes	Old Barn Way	BN42 4NS
257	John Nicholas Furniture	John Nicholas Furniture	Manor Hall Road	BN42 4NU
258	Alloy & Steel Metalworks	Alloy & Steel Metalworks	Manor Hall Road	BN42 4NH
262	Stepping Stones Children Family Centre, Council Health Centre	WSCC	Gardner Road	BN41 1PN
263	Community Centre Fishergate	Fishergate Community Association	West Road	BN41 1QH
264	Eastbrook Primary Academy (South Site)	WSCC	Gardner Road	BN41 1PN
265	Westlands Court, building 1	Adur Homes	Laylands Road	BN41 1PR
266	Westlands Court, building 2	Adur Homes	Laylands Road	BN41 1PR
267	Westlands Court, building 3	Adur Homes	Laylands Road	BN41 1PR
268	5-8 Laylands road	Adur Homes	Laylands Road	BN41 1PR
269	Wyck Court, building 1	Adur Homes	Laylands Road	BN41 1PR
270	Wyck Court, building 2	Adur Homes	Laylands Road	BN41 1PR
271	Laylands Court, building 1	Adur Homes	Laylands Road	BN41 1PR
272	Laylands Court, building 2	Adur Homes	Laylands Road	BN41 1PR
273	Laylands Court, building 3	Adur Homes	Laylands Road	BN41 1PR
274	Laylands Court, building 4	Adur Homes	Laylands Road	BN41 1PR
275	Old Mill Close, building 1	Adur Homes	Laylands Road	BN41 1PU
276	Old Mill Close, building 2	Adur Homes	Laylands Road	BN41 1PU
277	Old Mill Close, building 3	Adur Homes	Laylands Road	BN41 1PU
278	Old Mill Close, building 4	Adur Homes	Laylands Road	BN41 1PU
279	Summer Close	Adur Homes	Summer Close	BN41 1QF
280	Big Box Self Storage	Big Box Self Storage	Chapel Road	BN41 1PF
284	Kew Electrical	Kew Electrical	Chapel Road	BN41 1PF
286	Johnsons Apparel Master	Johnsons Apparel Master	Mill Road	BN41 1PD
288	Adams Packaging	Adams Packaging	Mill Road	BN41 1PQ
289	Southdown Construction Ltd, Fishergate Forge	Southdown Construction Ltd	Mill Road	BN41 1PD
294	Parker Steel	Parker Steel	Basin Road South	BN41 1UQ
295	Bartholomew Grain Dryers	Bartholomew Agri Foods	Basin Road South	BN41 1WF
298	Cemex	Cemex	Basin Road North	BN41 1DP
301	St Peter's Community Primary School	BHCC	St Peter's Road	BN41 1LS
303	CP Mechanical Designs Ltd	CP Mechanical Designs Ltd	Basin Road North	BN41 1DP
307	Jewson	Jewsons	Chapel Place	BN41 1DR
308	Jewsons Warehouse	Jewsons	Chapel Place	BN41 1DR
310	Eurovans Brighton	Eurovans	Ellen Street	BN41 1DW
312	Iveco	Iveco	Ellen Street	BN41 1DW
315	City Coast Church	City Coast Church	North Street	BN41 1DG
326	Travis Perkins 1	Travis Perkins	Wellington Road	BN41 1ET
327	Travis Perkins 2	Travis Perkins	Wellington Road	BN41 1ET
328	Travis Perkins 3	Travis Perkins	Wellington Road	BN41 1ET
333	Waterside House, Hove Enterprise Centre 4	Port Authority	Basin Road North	BN41 1UY
339	Beachwood Timber 1	Beachwood Timber	Basin Road North	BN41 1WA
340	Beachwood Timber 2	Beachwood Timber	Basin Road North	BN41 1WA
348	B & N Fish Sales 2	Brighton & Newhaven Fish Sales Ltd	Basin Road South	BN41 1WF
349	B & N Fish Sales 1	Brighton & Newhaven Fish Sales Ltd	Basin Road South	BN41 1WF
350	Quayside House	Port Authority	Basin Road South	BN41 1WF

Site ID	Building Name	Owner	Address	Postcode
353	Tozer Court	BHCC	Vale Road	BN41 1GD
354	Vale Court	BHCC	Vale Road	BN41 1GD
355	St Mary's Catholic Primary School	BHCC	Church Road	BN41 1LB
356	Portslade Health Centre	BHCC	Church Road	BN41 1LB
362	Benfield Primary School	BHCC	Old Shoreham Road	BN41 1XS
365	Portslade Town Hall	BHCC	Victoria Road	BN41 1YF
367	Boulder Brighton, Climbing Centre	Boulder Brighton	Victoria Road	BN41 1XQ
369	Rivervale Cars	Rivervale Cars	Victoria Road	BN41 1XQ
370	Mercedes-Benz of Brighton	Mercedes-Benz of Brighton	Victoria Road	BN41 1XQ
371	Lockers Prestige, car showroom	Lockers Prestige	Victoria Road	BN41 1XQ
372	Aldi	Aldi	Carlton Terrace	BN41 1XF
373	Job Centre	Other public sector	Boundary Road	BN3 7GA
374	EDF Offices 1	EDF	Portland Road	BN3 5SU
375	EDF Offices 2	EDF	Portland Road	BN3 5SU
376	EDF Offices 3	EDF	Portland Road	BN3 5SU
377	EDF Offices 4	EDF	Portland Road	BN3 5SU
378	EDF Offices 5	EDF	Portland Road	BN3 5SU
384	Wish Court, flats 1-23	BHCC	Ingram Crescent West	BN3 5NX
385	Wish Court, flats 24-32	BHCC	Ingram Crescent West	BN3 5NX
386	Muriel House	BHCC	Ingram Crescent West	BN3 5NX
387	Sanders House	BHCC	Ingram Crescent West	BN3 5NX
388	Jordan Court	Adur Homes	Ingram Crescent West	BN3 5NX
389	Knoll House	BHCC	Ingram Crescent West	BN3 5NX
390	Stevens Court	BHCC	Ingram Crescent West	BN3 5NX
391	Benson Court	BHCC	Ingram Crescent East	BN3 5NR
392	Mountbatten Court	BHCC	Ingram Crescent East	BN3 5NR
393	Lovegrove Court, flats 1-28	BHCC	Ingram Crescent East	BN3 5NR
394	Lovegrove Court, flats 29-54	BHCC	Ingram Crescent East	BN3 5NR
395	Ingram Court	Adur Homes	Ingram Crescent East	BN3 5NR
396	Ingram Court, flats 1-38	Adur Homes	Ingram Crescent East	BN3 5NR
397	King Alfred Leisure Centre	BHCC	Kingsway	BN3 2WW

APPENDIX 2 – ENERGY DATA

Key heat loads within the heat map boundary.

Site ID	Building Name	Existing/Planned Development	Building Use	Ownership	Heat Demand, kWh	Electricity demand, kWh	Peak Heat Demand, kW	Energy data source for heat modelling and profiling
1	Ricardo Industrial Building 1	Existing	Industrial	Private	1,049,457	122,934	809	CIBSE Guide F - Engineering table 20.20
2	Ricardo Industrial Building 2	Existing	Industrial	Private	445,592	107,141	353	CIBSE Guide F - Engineering table 20.20
3	Ricardo Industrial Building 3	Existing	Industrial	Private	288,973	105,114	229	CIBSE Guide F - Engineering table 20.20
4	Ricardo Industrial Building 4	Existing	Industrial	Private	275,738	134,300	218	CIBSE Guide F - Engineering table 20.20
5	Ricardo Industrial Building 5	Existing	Industrial	Private	718,020	438,253	569	CIBSE Guide F - Engineering table 20.20
6	Ricardo Industrial Building 6	Existing	Industrial	Private	513,423	376,683	407	CIBSE Guide F - Engineering table 20.20
7	Ricardo Industrial Building 7	Existing	Industrial	Private	524,453	449,443	415	CIBSE Guide F - Engineering table 20.20
8	Ricardo Industrial Building 8	Existing	Industrial	Private	543,203	532,491	430	CIBSE Guide F - Engineering table 20.20
9	Ricardo Offices 1	Existing	Offices	Private	328,494	182,959	260	CIBSE Guide F - Offices - naturally ventilated
10	Ricardo Offices 2	Existing	Offices	Private	71,823	40,003	57	CIBSE Guide F - Offices - naturally ventilated
11	Ricardo Offices 3	Existing	Offices	Private	66,082	36,805	52	CIBSE Guide F - Offices - naturally ventilated
12	Ricardo Offices 4	Existing	Offices	Private	40,414	22,509	32	CIBSE Guide F - Offices - naturally ventilated
13	Ricardo Offices 5	Existing	Offices	Private	32,422	18,058	26	CIBSE Guide F - Offices - naturally ventilated
14	Ricardo Offices 6	Existing	Offices	Private	95,689	53,295	76	CIBSE Guide F - Offices - naturally ventilated
15	Shoreham Airport Development	Planned Development	Mixed use	Private	1,323,238	505,250	907	CIBSE Guide F - Offices - naturally ventilated, CIBSE Guide F - Ministry of Defence - workshops and CIBSE Guide F - Retail - distribution warehouses
16	Hanger 1	Existing	Storage and distribution	Private	147,815	20,605	114	CIBSE Guide F - Ministry of Defence - aircraft hangers
17	Transair Pilot Shop	Existing	Storage and distribution	Private	101,507	69,642	78	CIBSE Guide F - Retail - Distribution warehouses
18	Hanger 2	Existing	Storage and distribution	Private	61,603	8,587	47	CIBSE Guide F - Ministry of Defence - aircraft hangers

Site ID	Building Name	Existing/Planned Development	Building Use	Ownership	Heat Demand, kWh	Electricity demand, kWh	Peak Heat Demand, kW	Energy data source for heat modelling and profiling
19	Perry Air	Existing	Storage and distribution	Private	71,765	49,237	55	CIBSE Guide F - Retail - Distribution warehouses
20	Hanger 3	Existing	Storage and distribution	Private	68,030	9,483	52	CIBSE Guide F - Ministry of Defence - aircraft hangers
21	Hanger 4	Existing	Storage and distribution	Private	85,586	11,930	66	CIBSE Guide F - Ministry of Defence - aircraft hangers
22	Shoreham Airport, Unknown Units 1	Existing	Storage and distribution	Private	53,766	36,888	41	CIBSE Guide F - Retail - Distribution warehouses
23	Shoreham Airport, Unknown Units 2	Existing	Storage and distribution	Private	56,315	38,637	43	CIBSE Guide F - Retail - Distribution warehouses
24	Shoreham Airport, Unknown Units 3	Existing	Storage and distribution	Private	54,925	37,683	42	CIBSE Guide F - Retail - Distribution warehouses
25	Shoreham Airport, Unknown Units 4	Existing	Storage and distribution	Private	67,130	46,057	52	CIBSE Guide F - Retail - Distribution warehouses
26	Shoreham Airport, Unknown Units 5	Existing	Storage and distribution	Private	91,928	63,070	71	CIBSE Guide F - Retail - Distribution warehouses
27	Shoreham Airport, Unknown Units 6	Existing	Storage and distribution	Private	195,134	133,878	150	CIBSE Guide F - Retail - Distribution warehouses
28	Shoreham Airport, Unknown Units 7	Existing	Storage and distribution	Private	50,753	34,821	39	CIBSE Guide F - Retail - Distribution warehouses
29	Shoreham Airport, Unknown Units 8	Existing	Storage and distribution	Private	24,257	16,642	19	CIBSE Guide F - Retail - Distribution warehouses
30	Shoreham Airport Terminal Building	Existing	Mixed use	Private	265,114	147,659	210	CIBSE Guide F - Offices - naturally ventilated
31	Shoreham Airport Building	Existing	Mixed use	Private	63,717	35,488	50	CIBSE Guide F - Offices - naturally ventilated
32	Shoreham Airport, Unknown Units 9	Existing	Storage and distribution	Private	138,432	94,976	107	CIBSE Guide F - Retail - Distribution warehouses
33	Northbrook College Sussex	Existing	Industrial	Private	250,921	29,393	193	CIBSE Guide F - Engineering table 20.23
34	Highdown House	Existing	Offices	Private	40,246	22,415	32	CIBSE Guide F - Offices - naturally ventilated
35	Shoreham Airport, Unknown Units 10	Existing	Storage and distribution	Private	24,952	17,119	19	CIBSE Guide F - Retail - Distribution warehouses
36	FTA	Existing	Retail	Private	83,515	57,298	64	CIBSE Guide F - Retail - Distribution warehouses
37	Shoreham Airport, Unknown Units 11	Existing	Storage and distribution	Private	82,735	56,763	64	CIBSE Guide F - Retail - Distribution warehouses

Site ID	Building Name	Existing/Planned Development	Building Use	Ownership	Heat Demand, kWh	Electricity demand, kWh	Peak Heat Demand, kW	Energy data source for heat modelling and profiling
38	Shoreham Airport, Unknown Units 12	Existing	Storage and distribution	Private	105,446	72,345	81	CIBSE Guide F - Retail - Distribution warehouses
39	Shoreham Airport, Unknown Units 13	Existing	Storage and distribution	Private	81,499	55,915	63	CIBSE Guide F - Retail - Distribution warehouses
40	Hanger 5	Existing	Storage and distribution	Private	56,587	7,888	44	CIBSE Guide F - Ministry of Defence - aircraft hangers
41	Gear4DJs	Existing	Retail	Private	47,115	32,325	36	CIBSE Guide F - Retail - Distribution warehouses
42	Shoreham Airport, Unknown Units 14	Existing	Storage and distribution	Private	24,334	16,695	19	CIBSE Guide F - Retail - Distribution warehouses
43	Grazing land south west of flyover development	Existing	Retail	Planned development	973,281	471,486	515	CIBSE TM46 - Large non-food shop
44	Tollbridge House	Existing	Social housing	Adur Homes	136,344	32,384	38	CIBSE Guide F - Residential and nursing homes
45	Ropetackle North, 12x House Type 3	Planned Development	Private residential	Planned development	169,837	40,339	79	CIBSE Guide F - Residential and nursing homes
46	Ropetackle North, 14x House Type 2	Planned Development	Private residential	Planned development	198,143	47,062	92	CIBSE Guide F - Residential and nursing homes
47	Ropetackle North, 18x railway arches	Planned Development	Offices	Planned development	27,851	15,512	22	CIBSE Guide F - Offices - naturally ventilated
48	Ropetackle North, 23x House Type 1	Planned Development	Private residential	Planned development	488,282	115,975	256	CIBSE Guide F - Residential and nursing homes
49	Ropetackle North, 2x Mews House Type 1	Planned Development	Private residential	Planned development	19,414	4,611	9	CIBSE Guide F - Residential and nursing homes
50	Ropetackle North, 3x House Type 4	Planned Development	Private residential	Planned development	42,459	10,085	20	CIBSE Guide F - Residential and nursing homes
51	Ropetackle North, 5x Mews House Type 2	Planned Development	Private residential	Planned development	48,536	11,528	22	CIBSE Guide F - Residential and nursing homes
52	Ropetackle North, Block A1	Planned Development	Retail	Planned development	37,050	226,005	21	CIBSE Guide F - Retail - supermarket
53	Ropetackle North, Block A2	Planned Development	Offices	Planned development	16,830	9,374	10	CIBSE Guide F - Offices - naturally ventilated
54	Ropetackle North, Block A3	Planned Development	Hospitality	Planned development	4,998	33,320	3	CIBSE Guide F - Retail - small food shop
55	Ropetackle North, Block B1	Planned Development	Offices	Planned development	55,837	31,099	44	CIBSE Guide F - Offices - naturally ventilated
56	Ropetackle North, Block C	Planned Development	Private residential	Planned development	141,531	33,616	65	CIBSE Guide F - Residential and nursing homes

Site ID	Building Name	Existing/Planned Development	Building Use	Ownership	Heat Demand, kWh	Electricity demand, kWh	Peak Heat Demand, kW	Energy data source for heat modelling and profiling
57	Ropetackle North, Block D	Planned Development	Private residential	Planned development	84,919	20,170	39	CIBSE Guide F - Residential and nursing homes
58	Ropetackle North, Block E	Planned Development	Hospitality	Planned development	836,160	321,600	209	CIBSE Guide F - Hotels - small
59	Ropetackle North, Block F	Planned Development	Retail	Planned development	71,606	35,008	43	CIBSE Guide F - Retail - high street agencies
60	Ropetackle North, Block G	Planned Development	Private residential	Planned development	113,225	26,893	52	CIBSE Guide F - Residential and nursing homes
61	Aston House	Existing	Social housing	Adur Homes	339,156	80,555	85	CIBSE Guide F - Residential and nursing homes
62	Buckingham Street, building 1	Existing	Social housing	Adur Homes	88,364	20,988	22	CIBSE Guide F - Residential and nursing homes
63	Buckingham Street, building 2	Existing	Social housing	Adur Homes	136,715	32,472	34	CIBSE Guide F - Residential and nursing homes
64	Buckingham Street, building 3	Existing	Social housing	Adur Homes	89,476	21,252	22	CIBSE Guide F - Residential and nursing homes
65	Homehaven Court	Existing	Social housing	Adur Homes	591,874	140,580	165	CIBSE Guide F - Residential and nursing homes
66	Swiss Gardens Primary School	Existing	Education	WSCC	129,136	75,757	170	Actual (WSCC)
67	Ropetackle Arts and Business Centre	Existing	Mixed use	Private	723,240	413,280	434	CIBSE Guide F - Entertainment - theatres
68	West Court	Existing	Social housing	Adur Homes	106,148	25,212	27	CIBSE Guide F - Residential and nursing homes
69	White Lion Court	Existing	Social housing	Adur Homes	104,481	24,816	26	CIBSE Guide F - Residential and nursing homes
70	The Original Factory Shop	Existing	Retail	Private	74,237	65,905	57	CIBSE Guide F - Retail - high street agencies
71	Coop, High Street	Existing	Retail	Private	34,476	210,304	21	CIBSE Guide F - Retail - supermarket
72	Shoreham Centre, Community Centre	Existing	Community and public buildings	ADC	214,875	50,424	167	CIBSE Guide F - Local authority buildings - community centre
73	Shoreham Centre, Council Offices	Existing	Offices	ADC	69,234	38,561	55	CIBSE Guide F - Offices - naturally ventilated
74	Pond Road, Community Building	Planned Development	Mixed use	Planned development	326,585	34,122	151	CIBSE Guide F - Offices - naturally ventilated, CIBSE Guide F - Public buildings - Libraries, CIBSE Guide F - Primary health

Site ID	Building Name	Existing/Planned Development	Building Use	Ownership	Heat Demand, kWh	Electricity demand, kWh	Peak Heat Demand, kW	Energy data source for heat modelling and profiling
								care and CIBSE Guide F - Residential and nursing homes
75	Pond Road, Residential	Planned Development	Private residential	Planned development	370,130	87,912	171	CIBSE Guide F - Residential and nursing homes
76	Cecil Norris House	Existing	Social Housing	Adur Homes	158,648	37,682	44	CIBSE Guide F - Residential and nursing homes
77	St Paul's Lodge	Existing	Social housing	Private	658,564	156,420	183	CIBSE Guide F - Residential and nursing homes
78	Royal Mail Delivery Office	Existing	Storage and distribution	Private	55,157	37,842	15	CIBSE Guide F - Retail - Distribution warehouses
79	Tarmount Lane, telephone exchange	Existing	Offices	Private	72,768	37,996	58	CIBSE Guide F - Offices - naturally ventilated
80	Police Station	Existing	Offices	Other public sector	134,956	169,632	38	Actual (Sussex Police)
81	Police Station Development	Planned Development	Mixed use	Planned development	950,011	234,718	13	CIBSE Guide F - Retail - high street agencies and CIBSE Guide F - Residential and nursing homes
82	Coop, Ham Road	Existing	Retail	Private	158,184	964,922	95	CIBSE Guide F - Retail - supermarket
83	Pashley Court	Existing	Social housing	Adur Homes	493,858	117,300	228	CIBSE Guide F - Residential and nursing homes
84	Riverside Business Centre, 12 units	Existing	Offices	Private	193,629	107,844	153	CIBSE Guide F - Offices - naturally ventilated
85	79-81 Brighton Road, Parcelforce site	Existing	Mixed use	Private	1,916,455	1,107,172	887	CIBSE Guide F - Retail - supermarket and CIBSE Guide F - Residential and nursing homes
86	Adur Civic Centre	Planned Development	Mixed use	Planned development	1,141,989	356,255	904	CIBSE Guide F - Offices - naturally ventilated
87	Adur Civic Centre Car Park	Planned Development	Mixed use	Planned development	261,230	145,495	207	CIBSE Guide F - Offices - naturally ventilated
88	Western Harbour Arm Flats 1	Planned Development	Private residential	Planned development	984,789	233,904	456	CIBSE Guide F - Residential and nursing homes
89	Western Harbour Arm Flats 2	Planned Development	Private residential	Planned development	1,642,056	390,016	760	CIBSE Guide F - Residential and nursing homes
90	Western Harbour Arm Flats 3	Planned Development	Private residential	Planned development	561,678	133,408	260	CIBSE Guide F - Residential and nursing homes
91	Western Harbour Arm Flats 4	Planned Development	Private residential	Planned development	577,239	137,104	267	CIBSE Guide F - Residential and nursing homes

Site ID	Building Name	Existing/Planned Development	Building Use	Ownership	Heat Demand, kWh	Electricity demand, kWh	Peak Heat Demand, kW	Energy data source for heat modelling and profiling
92	Western Harbour Arm Flats 5	Planned Development	Private residential	Planned development	620,958	147,488	287	CIBSE Guide F - Residential and nursing homes
93	Western Harbour Arm Flats 6	Planned Development	Private residential	Planned development	653,562	155,232	302	CIBSE Guide F - Residential and nursing homes
94	Western Harbour Arm Housing 1	Planned Development	Private residential	Planned development	449,694	106,810	208	CIBSE Guide F - Residential and nursing homes
95	Western Harbour Arm Housing 2	Planned Development	Private residential	Planned development	452,936	107,580	210	CIBSE Guide F - Residential and nursing homes
96	Western Harbour Arm Housing 3	Planned Development	Private residential	Planned development	439,969	104,500	204	CIBSE Guide F - Residential and nursing homes
97	Western Harbour Arm Housing 4	Planned Development	Private residential	Planned development	422,370	100,320	195	CIBSE Guide F - Residential and nursing homes
98	Western Harbour Arm Employment 1	Planned Development	Retail	Planned development	20,964	23,825	13	CIBSE Guide F - Retail - high street agencies
99	Western Harbour Arm Employment 2	Planned Development	Retail	Planned development	20,964	23,825	13	CIBSE Guide F - Retail - high street agencies
100	Western Harbour Arm Employment 3	Planned Development	Retail	Planned development	20,964	23,825	13	CIBSE Guide F - Retail - high street agencies
101	Western Harbour Arm Employment 4	Planned Development	Retail	Planned development	20,964	23,825	13	CIBSE Guide F - Retail - high street agencies
102	Palace Drinks, Alcohol Wholesaler	Existing	Storage and distribution	Private	116,261	79,765	90	CIBSE Guide F - Retail - Distribution warehouses
103	Dunelm Mill	Existing	Retail	Private	182,090	206,939	109	CIBSE Guide F - Retail - DIY stores
104	McDonalds, Eastern Avenue	Existing	Hospitality	Private	75,960	173,020	31	CIBSE Guide F - Catering - fast food restaurants
105	Halfords	Existing	Retail	Private	106,244	120,743	64	CIBSE Guide F - Retail - DIY stores
106	Paladone	Existing	Storage and distribution	Private	125,068	85,807	96	CIBSE Guide F - Retail - Distribution warehouses
107	Rosslyn Court, building 1	Existing	Social housing	Adur Homes	485,355	115,280	121	CIBSE Guide F - Residential and nursing homes
108	Rosslyn Court, building 2	Existing	Social housing	Adur Homes	123,377	29,304	31	CIBSE Guide F - Residential and nursing homes
109	Rosslyn Court, building 3	Existing	Social housing	Adur Homes	475,722	112,992	119	CIBSE Guide F - Residential and nursing homes
110	Buckingham Park Primary School	Existing	Education	WSCC	116,531	109,910	764	Actual (WSCC)
111	Fairlawns, building 1	Existing	Social housing	Adur Homes	47,795	11,352	13	CIBSE Guide F - Residential and nursing homes

Site ID	Building Name	Existing/Planned Development	Building Use	Ownership	Heat Demand, kWh	Electricity demand, kWh	Peak Heat Demand, kW	Energy data source for heat modelling and profiling
112	Fairlawns, building 2	Existing	Social housing	Adur Homes	72,618	17,248	20	CIBSE Guide F - Residential and nursing homes
113	Fairlawns, building 3	Existing	Social housing	Adur Homes	73,730	17,512	21	CIBSE Guide F - Residential and nursing homes
114	Fairlawns, building 4	Existing	Social housing	Adur Homes	72,989	17,336	20	CIBSE Guide F - Residential and nursing homes
115	Fairlawns, building 5	Existing	Social housing	Adur Homes	126,341	30,008	35	CIBSE Guide F - Residential and nursing homes
116	St Nicolas and St Mary Primary School	Existing	Education	WSCC	105,959	61,984	77	Actual (WSCC)
117	Northbourne Medical Centre	Planned Development	Private residential	Planned development	155,425	36,916	72	CIBSE Guide F - Residential and nursing homes
118	St Peters Roman Catholic Primary School	Existing	Education	WSCC	28,489	57,132	78	Actual (WSCC)
119	Southlands Hospital Development	Planned Development	Private residential	Planned development	1,547,578	367,576	716	CIBSE Guide F - Residential and nursing homes
120	Southlands Hospital	Existing	Healthcare	Other public sector	2,098,015	490,531	584	CIBSE Guide F - Hospitals
121	Elmcroft Care Home	Existing	Care homes	WSCC	368,193	246,271	165	Actual (WSCC)
122	Beeding Court	Existing	Social housing	Adur Homes	107,260	25,476	27	CIBSE Guide F - Residential and nursing homes
123	Bramber Court	Existing	Social housing	Adur Homes	102,814	24,420	26	CIBSE Guide F - Residential and nursing homes
124	Sompting Court	Existing	Social housing	Adur Homes	276,208	65,604	69	CIBSE Guide F - Residential and nursing homes
125	Southlands Court	Existing	Social housing	Adur Homes	219,521	52,140	55	CIBSE Guide F - Residential and nursing homes
126	Kingston Buci Children & Family Centre	Existing	Healthcare	WSCC	108,854	51,671	91	Actual (WSCC)
127	Cavell House Care Home	Existing	Care homes	Private	551,637	131,023	154	CIBSE Guide F - Residential and nursing homes
128	Glebelands Day Hospital	Existing	Healthcare	WSCC	208,022	122,191	120	Actual (WSCC)
129	Kingsland House Care Home	Existing	Care homes	Private	579,277	137,588	161	CIBSE Guide F - Residential and nursing homes
130	Warehouse, 13 Dolphin Road	Existing	Storage and distribution	Private	153,573	105,364	118	CIBSE Guide F - Retail - Distribution warehouses
131	Warehouse behind 13 Dolphin Road	Existing	Storage and distribution	Private	131,016	89,888	101	CIBSE Guide F - Retail - Distribution warehouses

Site ID	Building Name	Existing/Planned Development	Building Use	Ownership	Heat Demand, kWh	Electricity demand, kWh	Peak Heat Demand, kW	Energy data source for heat modelling and profiling
132	To let, previously PaperLinx	Existing	Storage and distribution	Private	619,082	424,742	477	CIBSE Guide F - Retail - Distribution warehouses
133	5 Industrial Units, Dolphin Way	Existing	Storage and distribution	Private	64,658	44,361	50	CIBSE Guide F - Retail - Distribution warehouses
134	House of Hugo	Existing	Storage and distribution	Private	225,950	109,487	93	CIBSE Guide F - Retail - Distribution warehouses
135	Gemini Press Printers	Existing	Industrial	Private	628,257	1,094,716	484	CIBSE Guide F - Textiles table 20.20
136	Gemini Press Warehouse	Existing	Storage and distribution	Private	346,008	225,460	267	CIBSE Guide F - Retail - Distribution warehouses
137	Dolphin Enterprise Centre, formerly Edwards	Existing	Storage and distribution	Private	221,409	142,411	171	CIBSE Guide F - Retail - Distribution warehouses
138	Dolphin Enterprise Centre, D, 4 units	Existing	Storage and distribution	Private	36,338	23,373	28	CIBSE Guide F - Retail - Distribution warehouses
139	Dolphin Enterprise Centre, C, 8 units	Existing	Storage and distribution	Private	71,523	46,004	55	CIBSE Guide F - Retail - Distribution warehouses
140	Dolphin Enterprise Centre, B, 8 units	Existing	Storage and distribution	Private	107,038	68,847	82	CIBSE Guide F - Retail - Distribution warehouses
141	Edgars, Dolphin Enterprise Centre, A, 4 units	Existing	Storage and distribution	Private	80,752	51,940	62	CIBSE Guide F - Retail - Distribution warehouses
142	DAF	Existing	Industrial	Private	185,063	40,890	143	CIBSE Guide F - Ministry of Defence workshops
143	Unknown Warehouse, behind DAF	Existing	Storage and distribution	Private	153,341	105,205	118	CIBSE Guide F - Retail - Distribution warehouses
144	Hall Business Centre	Existing	Offices	Private	82,743	46,085	66	CIBSE Guide F - Offices - naturally ventilated
145	Infinity Foods Coop	Existing	Storage and distribution	Private	684,590	469,686	395	CIBSE Guide F - Retail - Distribution warehouses
146	VW Heritage	Existing	Storage and distribution	Private	588,182	403,542	340	CIBSE Guide F - Retail - Distribution warehouses
147	Higgidy	Existing	Industrial	Private	772,550	1,705,868	146	Actual
148	Pyroban	Existing	Industrial	Private	638,895	267,364	422	CIBSE Guide F - Engineering table 20.20
149	G3 Business Park, Units 11-12	Existing	Storage and distribution	Private	37,080	25,440	30	CIBSE Guide F - Retail - Distribution warehouses
150	G3 Business Park, Units 1-7	Existing	Storage and distribution	Private	101,507	69,642	83	CIBSE Guide F - Retail - Distribution warehouses

Site ID	Building Name	Existing/Planned Development	Building Use	Ownership	Heat Demand, kWh	Electricity demand, kWh	Peak Heat Demand, kW	Energy data source for heat modelling and profiling
151	G3 Business Park, Units 8-10	Existing	Storage and distribution	Private	56,700	12,528	47	CIBSE Guide F - Ministry of Defence workshops
152	B&Q	Existing	Retail	Private	248,801	282,754	149	CIBSE Guide F - Retail - DIY stores
153	The Cyril Richings Business Centre, 4 units	Existing	Retail	Private	249,363	171,084	192	CIBSE Guide F - Retail - Distribution warehouses
154	Screw fix	Existing	Retail	Private	183,213	208,215	110	CIBSE Guide F - Retail - DIY stores
155	Howden's Joinery Co.	Existing	Storage and distribution	Private	75,546	85,856	58	CIBSE Guide F - Retail - DIY stores
156	Travis Perkins Timber & Building Supplies	Existing	Retail	Private	157,083	178,519	121	CIBSE Guide F - Retail - DIY stores
157	City Plumbing Supplies	Existing	Retail	Private	77,418	87,983	60	CIBSE Guide F - Retail - DIY stores
158	To let, warehouse opposite Howard Kent	Existing	Storage and distribution	Private	83,894	57,558	69	CIBSE Guide F - Retail - Distribution warehouses
159	RNLI Lifeboat station	Existing	Mixed use	Private	84,938	45,300	52	CIBSE Guide F - Public buildings - ambulance stations
160	Lidl Development	Planned Development	Retail	Planned development	192,900	1,176,690	126	CIBSE Guide F - Retail - supermarket
161	Western Harbour Arm Employment 9	Planned Development	Retail	Planned development	20,964	23,825	13	CIBSE Guide F - Retail - high street agencies
162	Western Harbour Arm Employment 10	Planned Development	Retail	Planned development	20,964	23,825	13	CIBSE Guide F - Retail - high street agencies
163	Western Harbour Arm Flats 9	Planned Development	Private residential	Planned development	1,495,338	355,168	784	CIBSE Guide F - Residential and nursing homes
164	Western Harbour Arm Flats 10	Planned Development	Private residential	Planned development	1,285,635	305,360	674	CIBSE Guide F - Residential and nursing homes
165	Western Harbour Arm Flats 11	Planned Development	Private residential	Planned development	462,384	109,824	242	CIBSE Guide F - Residential and nursing homes
166	Western Harbour Arm Flats 12	Planned Development	Private residential	Planned development	464,607	110,352	244	CIBSE Guide F - Residential and nursing homes
167	Western Harbour Arm Flats 13	Planned Development	Private residential	Planned development	447,564	106,304	235	CIBSE Guide F - Residential and nursing homes
168	Western Harbour Arm Flats 14	Planned Development	Private residential	Planned development	420,888	99,968	221	CIBSE Guide F - Residential and nursing homes
169	Western Harbour Arm Flats 15	Planned Development	Private residential	Planned development	424,593	100,848	223	CIBSE Guide F - Residential and nursing homes
170	Western Harbour Arm Flats 16	Planned Development	Private residential	Planned development	450,528	107,008	236	CIBSE Guide F - Residential and nursing homes

Site ID	Building Name	Existing/Planned Development	Building Use	Ownership	Heat Demand, kWh	Electricity demand, kWh	Peak Heat Demand, kW	Energy data source for heat modelling and profiling
171	Western Harbour Arm Flats 17	Planned Development	Private residential	Planned development	416,442	98,912	218	CIBSE Guide F - Residential and nursing homes
172	Western Harbour Arm Flats 18	Planned Development	Private residential	Planned development	367,536	87,296	193	CIBSE Guide F - Residential and nursing homes
173	Western Harbour Arm Flats 19	Planned Development	Private residential	Planned development	351,975	83,600	185	CIBSE Guide F - Residential and nursing homes
174	Western Harbour Arm Flats 20	Planned Development	Private residential	Planned development	368,277	87,472	170	CIBSE Guide F - Residential and nursing homes
175	Western Harbour Arm Flats 21	Planned Development	Private residential	Planned development	894,757	212,520	414	CIBSE Guide F - Residential and nursing homes
176	Shoreham Beach Primary School	Existing	Education	WSCC	33,102	47,393	38	Actual (WSCC)
177	Harbour Way Industrial Estate, Units 1-3	Existing	Retail	Private	260,700	145,200	201	CIBSE Guide F - Retail - DIY stores
178	Harbour Way Industrial Estate, Unit 4	Existing	Retail	Private	112,167	76,956	86	CIBSE Guide F - Retail - DIY stores
179	Unknown, next to Harbour Way Industrial Estate	Existing	Storage and distribution	Private	49,517	33,973	38	CIBSE Guide F - Retail - DIY stores
180	Co-op/American Golf	Existing	Retail	Private	52,338	319,262	31	CIBSE Guide F - Retail - DIY stores
181	Firestation	Existing	Mixed use	WSCC	77,049	39,140	37	Actual (WSCC)
182	Ambulance Station	Existing	Mixed use	Other public sector	68,775	13,100	19	CIBSE Guide F - Public buildings - ambulance stations
183	Holmbush Shopping Centre, Tesco	Existing	Retail	Private	789,516	4,816,048	456	CIBSE Guide F - Retail - supermarket
184	Holmbush Shopping Centre, McDonalds	Existing	Hospitality	Private	676,296	1,536,695	273	CIBSE Guide F - Catering - fast food restaurants
185	Holmbush Shopping Centre, Marks & Spencer	Existing	Retail	Private	815,256	4,973,062	489	CIBSE Guide F - Retail - supermarket
186	Holmbush Primary School	Existing	Education	WSCC	42,052	31,289	125	Actual (WSCC)
187	Herons Dale Primary School	Existing	Education	WSCC	219,191	169,629	100	Actual (WSCC)
188	Next	Existing	Retail	Private	104,621	502,183	63	CIBSE Guide F - Retail - clothes shop
189	Swimming Pool	Existing	Leisure	Private	324,032	114,608	93	CIBSE Guide F - Sports and recreation - leisure pool centre

Site ID	Building Name	Existing/Planned Development	Building Use	Ownership	Heat Demand, kWh	Electricity demand, kWh	Peak Heat Demand, kW	Energy data source for heat modelling and profiling
190	Loney Court	Existing	Social housing	Adur Homes	168,948	40,128	78	CIBSE Guide F - Residential and nursing homes
191	Fraser Court	Existing	Social housing	Adur Homes	252,311	59,928	117	CIBSE Guide F - Residential and nursing homes
192	Milward Court	Existing	Social housing	Private	639,766	157,742	198	CIBSE Guide F - Residential and nursing homes
193	Penstone Court	Existing	Social housing	Adur Homes	177,840	42,240	82	CIBSE Guide F - Residential and nursing homes
194	Julian Court	Existing	Social housing	Adur Homes	194,883	46,288	90	CIBSE Guide F - Residential and nursing homes
195	Wilmot Court	Existing	Social housing	Adur Homes	97,071	23,056	45	CIBSE Guide F - Residential and nursing homes
196	Osborne Court	Existing	Social housing	Adur Homes	169,689	40,304	79	CIBSE Guide F - Residential and nursing homes
197	Holmbush Court	Existing	Social housing	Adur Homes	146,718	34,848	68	CIBSE Guide F - Residential and nursing homes
198	Downes Court	Existing	Social housing	Adur Homes	98,924	23,496	46	CIBSE Guide F - Residential and nursing homes
199	Adur Court	Existing	Social Housing	Adur Homes	192,660	45,760	89	CIBSE Guide F - Residential and nursing homes
200	Broadway Court	Existing	Social housing	Adur Homes	227,487	54,032	105	CIBSE Guide F - Residential and nursing homes
201	Wiston Court	Existing	Social housing	Adur Homes	97,071	23,056	45	CIBSE Guide F - Residential and nursing homes
202	Arun Court	Existing	Social housing	Adur Homes	98,924	23,496	25	CIBSE Guide F - Residential and nursing homes
203	Arundel Court	Existing	Social housing	Adur Homes	214,149	50,864	99	CIBSE Guide F - Residential and nursing homes
204	Caius Court	Existing	Social housing	Adur Homes	98,924	23,496	46	CIBSE Guide F - Residential and nursing homes
205	Kingston Court	Existing	Social housing	Adur Homes	171,171	40,656	79	CIBSE Guide F - Residential and nursing homes
206	Shoreham Academy	Existing	Education	Private	1,562,004	482,100	851	CIBSE Guide F - Education - secondary
207	Shoreham College	Existing	Education	Private	968,426	263,703	528	CIBSE Guide F - Education - secondary (with swimming pool)
208	Ashcroft Sheltered Housing	Existing	Social housing	Adur Homes	337,896	80,256	94	CIBSE Guide F - Residential and nursing homes

Site ID	Building Name	Existing/Planned Development	Building Use	Ownership	Heat Demand, kWh	Electricity demand, kWh	Peak Heat Demand, kW	Energy data source for heat modelling and profiling
209	Marsh House	Existing	Social housing	Adur Homes	484,799	115,148	121	CIBSE Guide F - Residential and nursing homes
210	Glebe Primary School	Existing	Education	WSCC	180,851	114,764	193	Actual (WSCC)
211	Kingsfield Close	Existing	Social housing	Adur Homes	157,833	37,488	39	CIBSE Guide F - Residential and nursing homes
212	The Green, building 1	Existing	Social housing	Adur Homes	46,313	11,000	13	CIBSE Guide F - Residential and nursing homes
213	The Green, building 2	Existing	Social housing	Adur Homes	46,313	11,000	13	CIBSE Guide F - Residential and nursing homes
214	The Green, building 3	Existing	Social housing	Adur Homes	46,683	11,088	13	CIBSE Guide F - Residential and nursing homes
215	Hope Cottages	Existing	Social housing	Adur Homes	150,053	35,640	42	CIBSE Guide F - Residential and nursing homes
216	Southwick Christian Community Church	Existing	Community and public buildings	Private	68,798	14,998	42	CIBSE Guide F - Local authority buildings - community centre
217	Romans Care Home	Existing	Care homes	Private	90,032	21,384	25	CIBSE Guide F - Residential and nursing homes
218	2 Southwick Square	Existing	Offices	Private	40,865	22,760	32	CIBSE Guide F - Offices - naturally ventilated
219	Dudman Aggregate	Existing	Industrial	Private	140,363	96,301	108	CIBSE Guide F - Ministry of Defence - stores/warehouse (unoccupied)
220	Grange Industrial Estate, Coppard plant hire	Existing	Retail	Private	39,533	44,928	32	CIBSE Guide F - Retail - DIY stores
221	Grange Industrial Estate, Southover Food Company	Existing	Storage and distribution	Private	102,810	116,840	85	CIBSE Guide F - Retail - Distribution warehouses
222	Grange Industrial Estate, The Tile Source, Showroom	Existing	Retail	Private	109,962	124,968	70	CIBSE Guide F - Retail - DIY stores
223	Grange Industrial Estate, Eyre & Elliston, Electrical Distributors	Existing	Social housing	Private	62,109	42,612	51	CIBSE Guide F - Retail - Distribution warehouses
224	Grange Industrial Estate, Wemoto, motorcycle parts	Existing	Storage and distribution	Private	111,086	76,214	91	CIBSE Guide F - Retail - Distribution warehouses

Site ID	Building Name	Existing/Planned Development	Building Use	Ownership	Heat Demand, kWh	Electricity demand, kWh	Peak Heat Demand, kW	Energy data source for heat modelling and profiling
225	Grange Industrial Estate, Optimum Kitchen Appliance Centre	Existing	Retail	Private	54,208	61,605	35	CIBSE Guide F - Retail - DIY stores
226	Wyndeham Grange, Printers	Existing	Industrial	Private	304,087	569,531	234	CIBSE Guide F - Textiles table 20.20
227	Wyndeham Grange Press Offices	Existing	Offices	Private	152,314	84,833	234	CIBSE Guide F - Offices - naturally ventilated
228	Locks Court	Existing	Social housing	Private	268,427	63,756	124	CIBSE Guide F - Residential and nursing homes
229	Grange Court	Existing	Social housing	Adur Homes	416,813	99,000	193	CIBSE Guide F - Residential and nursing homes
230	Coates Court, building 1	Existing	Social housing	Adur Homes	242,307	57,552	112	CIBSE Guide F - Residential and nursing homes
231	Coates Court, building 2	Existing	Social housing	Adur Homes	372,723	88,528	172	CIBSE Guide F - Residential and nursing homes
232	Coates Court, building 3	Existing	Social housing	Adur Homes	123,747	29,392	57	CIBSE Guide F - Residential and nursing homes
233	Watling Court, building 2	Existing	Social housing	Adur Homes	502,028	119,240	232	CIBSE Guide F - Residential and nursing homes
234	Watling Court, building 1	Existing	Social housing	Adur Homes	386,802	91,872	179	CIBSE Guide F - Residential and nursing homes
235	Spring Gardens	Existing	Social housing	Adur Homes	109,483	26,004	51	CIBSE Guide F - Residential and nursing homes
236	Rock Close, building 2	Existing	Social housing	Adur Homes	311,220	73,920	144	CIBSE Guide F - Residential and nursing homes
237	Rock Close, building 1	Existing	Social housing	Adur Homes	311,220	73,920	144	CIBSE Guide F - Residential and nursing homes
238	Channel View	Existing	Social housing	Adur Homes	172,838	41,052	80	CIBSE Guide F - Residential and nursing homes
239	Sea House	Existing	Social housing	Adur Homes	416,813	99,000	193	CIBSE Guide F - Residential and nursing homes
240	Harbour Court	Existing	Social housing	Private	172,838	41,052	80	CIBSE Guide F - Residential and nursing homes
241	Albion House	Existing	Social Housing	Adur Homes	252,866	60,060	117	CIBSE Guide F - Residential and nursing homes
242	Dudman Offices	Existing	Offices	Private	34,617	19,280	27	CIBSE Guide F - Offices - naturally ventilated

Site ID	Building Name	Existing/Planned Development	Building Use	Ownership	Heat Demand, kWh	Electricity demand, kWh	Peak Heat Demand, kW	Energy data source for heat modelling and profiling
243	Nautilus House, Port Authority Offices	Existing	Offices	Port Authority	45,553	16,302	36	Actual
244	Southwick Waterfront, Lady Bee Marina	Planned Development	Mixed use	Planned development	335,700	112,000	266	CIBSE Guide F - Offices - naturally ventilated and CIBSE Guide F - Ministry of Defence - workshops
245	Old Town Hall	Existing	Offices	Private	16,211	9,029	13	CIBSE Guide F - Offices - naturally ventilated
246	PB Law solicitors	Existing	Offices	Private	39,852	22,196	32	CIBSE Guide F - Offices - naturally ventilated
247	Doctors Surgery, Manor Practise	Existing	Healthcare	Private	64,989	0	51	CIBSE Guide F - Primary Health Care
248	Southwick Library	Existing	Community and public buildings	WSCC	15,293	1,808	14	Actual (WSCC)
249	Southwick Community Association	Existing	Community and public buildings	Private	371,063	87,076	226	CIBSE Guide F - Local authority buildings - community centre
250	Eastbrook Primary Academy (North site)	Existing	Education	WSCC	654,308	127,619	499	Actual (WSCC)
251	Leisure Centre	Existing	Leisure	Private	353,628	171,456	113	CIBSE Guide F - Sports and recreation - combined centre
252	Indoor Bowling Club	Existing	Leisure	Private	136,282	85,478	94	CIBSE Guide F - Sports and recreation - combined centre
253	Lewis Court	Existing	Social housing	Adur Homes	97,812	23,232	45	CIBSE Guide F - Residential and nursing homes
254	Manor Court	Existing	Social housing	Adur Homes	207,851	49,368	58	CIBSE Guide F - Residential and nursing homes
255	Barn Court	Existing	Social housing	Adur Homes	97,812	23,232	45	CIBSE Guide F - Residential and nursing homes
256	Land Adjacent to Eastbrook Academy	Planned Development	Private residential	Planned development	535,558	127,204	248	CIBSE Guide F - Residential and nursing homes
257	John Nicholas Furniture	Existing	Retail	Private	241,542	81,508	186	CIBSE Guide F - Light manufacturing table 20.20
258	Alloy & Steel Metalworks	Existing	Industrial	Private	339,471	114,554	262	CIBSE Guide F - Light manufacturing table 20.20
259	Chalex Industrial Estate	Existing	Industrial	Private	121,984	26,953	100	CIBSE Guide F - Ministry of Defence workshops

Site ID	Building Name	Existing/Planned Development	Building Use	Ownership	Heat Demand, kWh	Electricity demand, kWh	Peak Heat Demand, kW	Energy data source for heat modelling and profiling
260	Former Eastbrook Allotments	Existing	Private residential	Planned development	634,607	186,816	503	CIBSE Guide F - Offices - naturally ventilated and CIBSE Guide F - Ministry of Defence - workshops
261	Nyenex House	Planned Development	Offices	Planned development	311,945	173,742	320	CIBSE Guide F - Retail - DIY stores
262	Stepping Stones Children Family Centre, Council Health Centre	Existing	Healthcare	WSCC	41,593	17,093	51	Actual (WSCC)
263	Community Centre Fishergate	Existing	Community and public buildings	Private	138,844	32,582	85	CIBSE Guide F - Local authority buildings - community centre
264	Eastbrook Primary Academy (South Site)	Existing	Education	WSCC	87,010	40,156	54	Actual (WSCC)
265	Westlands Court, building 1	Existing	Social housing	Adur Homes	108,371	25,740	27	CIBSE Guide F - Residential and nursing homes
266	Westlands Court, building 2	Existing	Social housing	Adur Homes	428,298	101,728	107	CIBSE Guide F - Residential and nursing homes
267	Westlands Court, building 3	Existing	Social housing	Adur Homes	107,816	25,608	27	CIBSE Guide F - Residential and nursing homes
268	5-8 Laylands road	Existing	Mixed use	Adur Homes	86,500	24,221	52	CIBSE Guide F - Residential and nursing homes and CIBSE Guide F - Retail - High street agencies
269	Wyck Court, building 1	Existing	Social housing	Adur Homes	167,281	39,732	77	CIBSE Guide F - Residential and nursing homes
270	Wyck Court, building 2	Existing	Social housing	Adur Homes	112,262	26,664	52	CIBSE Guide F - Residential and nursing homes
271	Laylands Court, building 1	Existing	Social housing	Adur Homes	105,037	24,948	49	CIBSE Guide F - Residential and nursing homes
272	Laylands Court, building 2	Existing	Social housing	Adur Homes	288,990	68,640	134	CIBSE Guide F - Residential and nursing homes
273	Laylands Court, building 3	Existing	Social housing	Adur Homes	106,148	25,212	49	CIBSE Guide F - Residential and nursing homes
274	Laylands Court, building 4	Existing	Social housing	Adur Homes	105,593	25,080	49	CIBSE Guide F - Residential and nursing homes
275	Old Mill Close, building 1	Existing	Social housing	Adur Homes	105,593	25,080	49	CIBSE Guide F - Residential and nursing homes
276	Old Mill Close, building 2	Existing	Social housing	Adur Homes	105,037	24,948	49	CIBSE Guide F - Residential and nursing homes

Site ID	Building Name	Existing/Planned Development	Building Use	Ownership	Heat Demand, kWh	Electricity demand, kWh	Peak Heat Demand, kW	Energy data source for heat modelling and profiling
277	Old Mill Close, building 3	Existing	Social housing	Adur Homes	216,743	51,480	100	CIBSE Guide F - Residential and nursing homes
278	Old Mill Close, building 4	Existing	Social housing	Adur Homes	106,148	25,212	49	CIBSE Guide F - Residential and nursing homes
279	Summer Close	Existing	Social housing	Adur Homes	202,478	48,092	56	CIBSE Guide F - Residential and nursing homes
280	Big Box Self Storage	Existing	Storage and distribution	Private	470,258	114,002	387	CIBSE Guide F - Retail - Distribution warehouses
281	Tungsten Buildings, 12 units	Existing	Offices	Private	120,455	67,089	95	CIBSE Guide F - Offices - naturally ventilated
282	Greg Stone, flooring	Existing	Retail	Private	55,555	63,137	44	CIBSE Guide F - Retail - DIY stores
283	R&D Goatley Ltd	Existing	Retail	Private	72,037	76,751	57	CIBSE Guide F - Retail - DIY stores
284	Kew Electrical	Existing	Storage and distribution	Private	246,737	169,282	190	CIBSE Guide F - Retail - Distribution warehouses
285	Chapel Road, Warehouse units	Existing	Storage and distribution	Private	179,838	123,384	148	CIBSE Guide F - Retail - Distribution warehouses
286	Johnsons Apparel Master	Existing	Storage and distribution	Private	103,091	67,502	71	CIBSE Guide F - Retail - Distribution warehouses
287	Mill Road Industrial Estate	Existing	Industrial	Private	90,614	62,169	74	CIBSE Guide F - Retail - Distribution warehouses
288	Adams Packaging	Existing	Storage and distribution	Private	107,687	73,882	89	CIBSE Guide F - Retail - Distribution warehouses
289	Southdown Construction Ltd, Fishergate Forge	Existing	Industrial	Private	457,326	154,324	352	CIBSE Guide F - Light manufacturing table 20.20
290	The Adenstar Group offices	Existing	Offices	Private	45,841	25,531	75	CIBSE Guide F - Offices - naturally ventilated
291	Basin Road South, Warehouse 3	Existing	Storage and distribution	Planned development	46,089	3,414	31	CIBSE Guide F - Ministry of Defence - stores/warehouse (unoccupied)
292	Basin Road South, Warehouse 4	Existing	Storage and distribution	Planned development	208,980	15,480	141	CIBSE Guide F - Ministry of Defence - stores/warehouse (unoccupied)
293	Basin Road South, Warehouse 5	Existing	Storage and distribution	Planned development	97,038	7,188	66	CIBSE Guide F - Ministry of Defence - stores/warehouse (unoccupied)
294	Parker Steel	Existing	Storage and distribution	Private	603,653	44,715	121	CIBSE Guide F - Ministry of Defence - stores/warehouse (unoccupied)
295	Bartholomew Grain Dryers	Existing	Industrial	Private	447,059	622,730	393	Actual
296	Basin Road South, Warehouse 9	Existing	Storage and distribution	Planned development	59,819	4,431	47	CIBSE Guide F - Ministry of Defence - stores/warehouse (unoccupied)

Site ID	Building Name	Existing/Planned Development	Building Use	Ownership	Heat Demand, kWh	Electricity demand, kWh	Peak Heat Demand, kW	Energy data source for heat modelling and profiling
297	Basin Road South, Warehouse 10	Existing	Storage and distribution	Planned development	113,360	8,397	90	CIBSE Guide F - Ministry of Defence - stores/warehouse (unoccupied)
298	Cemex	Existing	Industrial	Private	44,625	N/A	34	Actual
299	South Portslade, residential 5.1	Planned Development	Private residential	Planned development	165,614	39,336	77	CIBSE Guide F - Residential and nursing homes
300	South Portslade, residential houses next to 5.1	Planned Development	Private residential	Planned development	116,337	27,632	54	CIBSE Guide F - Residential and nursing homes
301	St Peter's Community Primary School	Existing	Education	BHCC	161,195	41,844	88	CIBSE Guide F - Education - primary
302	South Portslade, residential 4.1	Planned Development	Private residential	Planned development	425,704	101,112	197	CIBSE Guide F - Residential and nursing homes
303	CP Mechanical Designs Limited	Existing	Industrial	Private	55,647	18,778	38	CIBSE Guide F - Light manufacturing table 20.20
304	South Portslade Industrial Redevelopment, A	Planned Development	Industrial	Planned development	535,471	277,369	424	CIBSE Guide F - Offices - naturally ventilated and CIBSE Guide F - Retail - High street agencies
305	South Portslade Industrial Redevelopment, B	Planned Development	Industrial	Planned development	440,411	228,129	349	CIBSE Guide F - Offices - naturally ventilated and CIBSE Guide F - Retail - High street agencies
306	London & Brighton Plating	Existing	Industrial	Private	52,460	29,218	40	CIBSE Guide F - Offices - naturally ventilated
307	Jewson	Existing	Retail	Private	45,522	51,735	27	CIBSE Guide F - Retail - DIY stores
308	Jewsons Warehouse	Existing	Storage and distribution	Private	94,322	64,713	73	CIBSE Guide F - Retail - Distribution warehouses
309	Offices, 2 North Street	Existing	Offices	Private	130,362	72,607	103	CIBSE Guide F - Offices - naturally ventilated
310	Eurovans Brighton	Existing	Retail	Private	260,642	178,822	201	CIBSE Guide F - Retail - Distribution warehouses
311	D W Electrical	Existing	Retail	Private	24,541	13,669	19	CIBSE Guide F - Retail - Distribution warehouses
312	Iveco	Existing	Retail	Private	113,250	63,076	90	CIBSE Guide F - Offices - naturally ventilated
313	Unknown Offices, North Street	Existing	Offices	Private	165,936	92,420	131	CIBSE Guide F - Offices - naturally ventilated
314	Display House	Existing	Offices	Private	52,235	29,093	41	CIBSE Guide F - Offices - naturally ventilated

Site ID	Building Name	Existing/Planned Development	Building Use	Ownership	Heat Demand, kWh	Electricity demand, kWh	Peak Heat Demand, kW	Energy data source for heat modelling and profiling
315	City Coast Church	Existing	Community and public buildings	Private	420,469	98,670	256	CIBSE Guide F - Local authority buildings - community centre
316	Offices, East Street	Existing	Offices	Private	29,270	16,302	23	CIBSE Guide F - Offices - naturally ventilated
317	South Portslade, residential 2.1	Planned Development	Private residential	Planned development	263,958	73,911	122	CIBSE Guide F - Residential and nursing homes
318	Warehouse, East Street	Existing	Storage and distribution	Private	79,336	54,431	61	CIBSE Guide F - Retail - Distribution warehouses
319	Offices, North Street	Existing	Private residential	Private	36,925	20,566	29	CIBSE Guide F - Offices - naturally ventilated
320	South Portslade Industrial Redevelopment, C 1	Planned Development	Industrial	Planned development	408,022	211,352	323	CIBSE Guide F - Offices - naturally ventilated and CIBSE Guide F - Retail - High street agencies
321	South Portslade Industrial Redevelopment, C 2	Planned Development	Industrial	Planned development	177,086	91,729	140	CIBSE Guide F - Offices - naturally ventilated and CIBSE Guide F - Retail - High street agencies
322	South Portslade, residential 3.1	Planned Development	Private residential	Planned development	573,395	160,557	265	CIBSE Guide F - Residential and nursing homes
323	South Portslade Industrial Redevelopment, D	Planned Development	Industrial	Planned development	169,976	88,046	135	CIBSE Guide F - Offices - naturally ventilated and CIBSE Guide F - Retail - High street agencies
324	South Portslade, residential 1.2	Planned Development	Private residential	Planned development	186,176	44,220	86	CIBSE Guide F - Residential and nursing homes
325	South Portslade, residential 1.1	Planned Development	Private residential	Planned development	1,060,371	251,856	491	CIBSE Guide F - Residential and nursing homes
326	Travis Perkins 1	Existing	Retail	Private	88,724	100,832	53	CIBSE Guide F - Retail - DIY stores
327	Travis Perkins 2	Existing	Retail	Private	52,111	59,223	31	CIBSE Guide F - Retail - DIY stores
328	Travis Perkins 3	Existing	Retail	Private	123,986	85,065	96	CIBSE Guide F - Retail - DIY stores
329	Aldrington Basin Warehouses, Plot 3.1	Planned Development	Storage and distribution	Planned development	56,288	31,350	45	CIBSE Guide F - Offices - naturally ventilated
330	Hove Enterprise Centre 1	Existing	Offices	Private	21,164	11,788	17	CIBSE Guide F - Offices - naturally ventilated
331	Hove Enterprise Centre 2	Existing	Offices	Private	16,549	9,217	13	CIBSE Guide F - Offices - naturally ventilated
332	Hove Enterprise Centre 3	Existing	Offices	Private	14,860	8,276	12	CIBSE Guide F - Offices - naturally ventilated

Site ID	Building Name	Existing/Planned Development	Building Use	Ownership	Heat Demand, kWh	Electricity demand, kWh	Peak Heat Demand, kW	Energy data source for heat modelling and profiling
333	Waterside House, Hove Enterprise Centre 4	Existing	Offices	Port Authority	41,540	23,136	33	CIBSE Guide F - Offices - naturally ventilated
334	Hove Enterprise Centre 5, Units 1-9	Existing	Offices	Private	34,448	19,186	27	CIBSE Guide F - Offices - naturally ventilated
335	Aldrington Basin Warehouses, Plot 4.1	Planned Development	Storage and distribution	Planned development	33,153	18,465	26	CIBSE Guide F - Offices - naturally ventilated
336	Maritime House	Planned Development	Private residential	Planned development	182,263	275,420	144	CIBSE Guide F - Residential and nursing homes
337	Warehouse East of Maritime House	Existing	Storage and distribution	Private	26,005	14,484	21	CIBSE Guide F - Offices - naturally ventilated
338	Basin Road North, Warehouse 1	Existing	Storage and distribution	Planned development	75,396	51,728	58	CIBSE Guide F - Retail - Distribution warehouses
339	Beachwood Timber 1	Existing	Retail	Private	121,069	137,591	73	CIBSE Guide F - Retail - DIY stores
340	Beachwood Timber 2	Existing	Retail	Private	41,027	3,039	28	CIBSE Guide F - Retail - Distribution warehouses
341	Aldrington Basin Warehouses, Plot 5.1	Planned Development	Storage and distribution	Planned development	71,279	81,006	43	CIBSE Guide F - Retail - DIY stores
342	Aldrington Basin, PortZED Development	Planned Development	Mixed use	Planned development	673,014	256,546	311	CIBSE Guide F - Retail - DIY stores and CIBSE Guide F - Residential and nursing homes
343	Blue Lagoon Bar	Existing	Hospitality	Private	258,300	127,920	104	CIBSE TM46 - Bar, pub or licensed club
344	Vega	Existing	Social housing	BHCC	783,237	186,032	362	CIBSE Guide F - Residential and nursing homes
345	Offices behind Vega	Existing	Offices	Private	97,029	32,197	77	CIBSE Guide F - Offices - naturally ventilated
346	Aldrington Basin Warehouses, Plot 2.1	Planned Development	Storage and distribution	Planned development	43,426	49,352	26	CIBSE Guide F - Retail - DIY stores
347	Aldrington Basin Warehouses, Plot 2.2	Planned Development	Storage and distribution	Planned development	43,426	49,352	26	CIBSE Guide F - Retail - DIY stores
348	B & N Fish Sales 2	Existing	Retail	Private	6,953	4,770	5	CIBSE Guide F - Retail - Distribution warehouses
349	B & N Fish Sales 1	Existing	Retail	Private	69,680	47,806	54	CIBSE Guide F - Retail - Distribution warehouses
350	Quayside House	Existing	Offices	Port Authority	264,968	181,790	204	CIBSE Guide F - Retail - Distribution warehouses
351	Basin Road South, Offices 1	Existing	Offices	Planned development	127,210	70,851	101	CIBSE Guide F - Offices - naturally ventilated

Site ID	Building Name	Existing/Planned Development	Building Use	Ownership	Heat Demand, kWh	Electricity demand, kWh	Peak Heat Demand, kW	Energy data source for heat modelling and profiling
352	Basin Road South, Offices 2	Existing	Offices	Planned development	30,789	17,148	24	CIBSE Guide F - Offices - naturally ventilated
353	Tozer Court	Existing	Social housing	BHCC	190,067	45,144	88	CIBSE Guide F - Residential and nursing homes
354	Vale Court	Existing	Social housing	BHCC	158,389	37,620	73	CIBSE Guide F - Residential and nursing homes
355	St Mary's Catholic Primary School	Existing	Education	BHCC	46,787	72,717	19	Actual (BHCC)
356	Portslade Health Centre	Existing	Healthcare	BHCC	237,249	0	188	CIBSE Guide F - Primary Health Care
357	Portslade Community Centre	Existing	Community and public buildings	Private	74,250	17,424	45	CIBSE Guide F - Local authority buildings - community centre
358	Portslade Library & Children's Centre	Existing	Community and public buildings	Private	63,488	25,274	39	CIBSE Guide F - Local Authority buildings - day centres
359	Footsteps Day Nursery	Existing	Education	Private	78,309	20,328	43	CIBSE Guide F - Education - primary
360	Caffyns Volkswagen, Car Showroom	Existing	Retail	Private	108,746	605,566	65	CIBSE TM46 - Large non-food shop
361	Dinnages, Car showroom	Existing	Retail	Private	98,751	54,216	59	CIBSE TM46 - Large non-food shop
362	Benfield Primary School	Existing	Education	BHCC	181,268	94,818	220	CIBSE Guide F - Education - primary
363	Mini, Car Garage	Existing	Retail	Private	23,577	12,944	68	CIBSE TM46 - Large non-food shop
364	Chandlers Cars	Existing	Retail	Private	286,088	157,068	172	CIBSE TM46 - Large non-food shop
365	Portslade Town Hall	Existing	Offices	BHCC	70,936	41,765	42	Actual (BHCC)
366	Portslade Community Buildings (behind Town Hall)	Existing	Community and public buildings	Private	47,394	26,397	29	CIBSE Guide F - Local authority buildings - community centre
367	Boulder Brighton, Climbing Centre	Existing	Leisure	Private	272,076	146,944	210	CIBSE Guide F - Sports and recreation - combined centre
369	Rivervale Cars	Existing	Retail	Private	113,103	62,096	68	CIBSE TM46 - Large non-food shop
370	Mercedes-Benz, car showroom	Existing	Retail	Private	255,677	140,372	153	CIBSE TM46 - Large non-food shop
371	Lockers Prestige, car showroom	Existing	Retail	Private	48,436	26,592	29	CIBSE TM46 - Large non-food shop
372	Aldi	Existing	Storage and distribution	Private	137,670	839,787	83	CIBSE Guide F - Residential and nursing homes
373	Job Centre	Existing	Offices	Private	73,174	40,755	40	CIBSE Guide F - Offices - naturally ventilated

Site ID	Building Name	Existing/Planned Development	Building Use	Ownership	Heat Demand, kWh	Electricity demand, kWh	Peak Heat Demand, kW	Energy data source for heat modelling and profiling
374	EDF Offices 1	Existing	Offices	Private	54,374	30,284	43	CIBSE Guide F - Offices - naturally ventilated
375	EDF Offices 2	Existing	Offices	Private	42,103	23,450	33	CIBSE Guide F - Offices - naturally ventilated
376	EDF Offices 3	Existing	Offices	Private	14,747	8,214	12	CIBSE Guide F - Offices - naturally ventilated
377	EDF Offices 4	Existing	Offices	Private	408,985	227,789	324	CIBSE Guide F - Offices - naturally ventilated
378	EDF Offices 5	Existing	Offices	Private	129,799	72,293	103	CIBSE Guide F - Offices - naturally ventilated
379	Martello House, residential development	Planned Development	Social housing	Planned development	213,339	65,085	112	CIBSE Guide F - Residential and nursing homes
380	Portland Road Trading Estate	Existing	Retail	Private	487,911	334,748	376	CIBSE Guide F - Retail - Distribution warehouses
381	Portland Business Park 1	Existing	Retail	Private	193,366	132,665	116	CIBSE Guide F - Retail - Distribution warehouses
382	Portland Business Park 2	Existing	Retail	Private	161,276	110,649	97	CIBSE Guide F - Retail - Distribution warehouses
383	Portland Business Park 3	Existing	Retail	Private	172,974	118,674	104	CIBSE Guide F - Retail - Distribution warehouses
384	Wish Court, flats 1-23	Existing	Social housing	BHCC	345,677	82,104	395	CIBSE Guide F - Residential and nursing homes
385	Wish Court, flats 24-32	Existing	Social housing	BHCC	262,870	62,436	522	CIBSE Guide F - Residential and nursing homes
386	Muriel House	Existing	Social housing	BHCC	320,151	51,811	148	Actual (BHCC)
387	Sanders House	Existing	Social housing	BHCC	226,940	46,433	105	Actual (BHCC)
388	Jordan Court	Existing	Social housing	Adur Homes	569,644	135,300	264	CIBSE Guide F - Residential and nursing homes
389	Knoll House	Existing	Social housing	BHCC	247,667	144,378	69	Actual (BHCC)
390	Stevens Court	Existing	Social housing	BHCC	1,620,567	384,912	750	CIBSE Guide F - Residential and nursing homes
391	Benson Court	Existing	Social housing	BHCC	1,128,728	268,092	522	CIBSE Guide F - Residential and nursing homes
392	Mountbatten Court	Existing	Social housing	BHCC	1,157,072	274,824	535	CIBSE Guide F - Residential and nursing homes

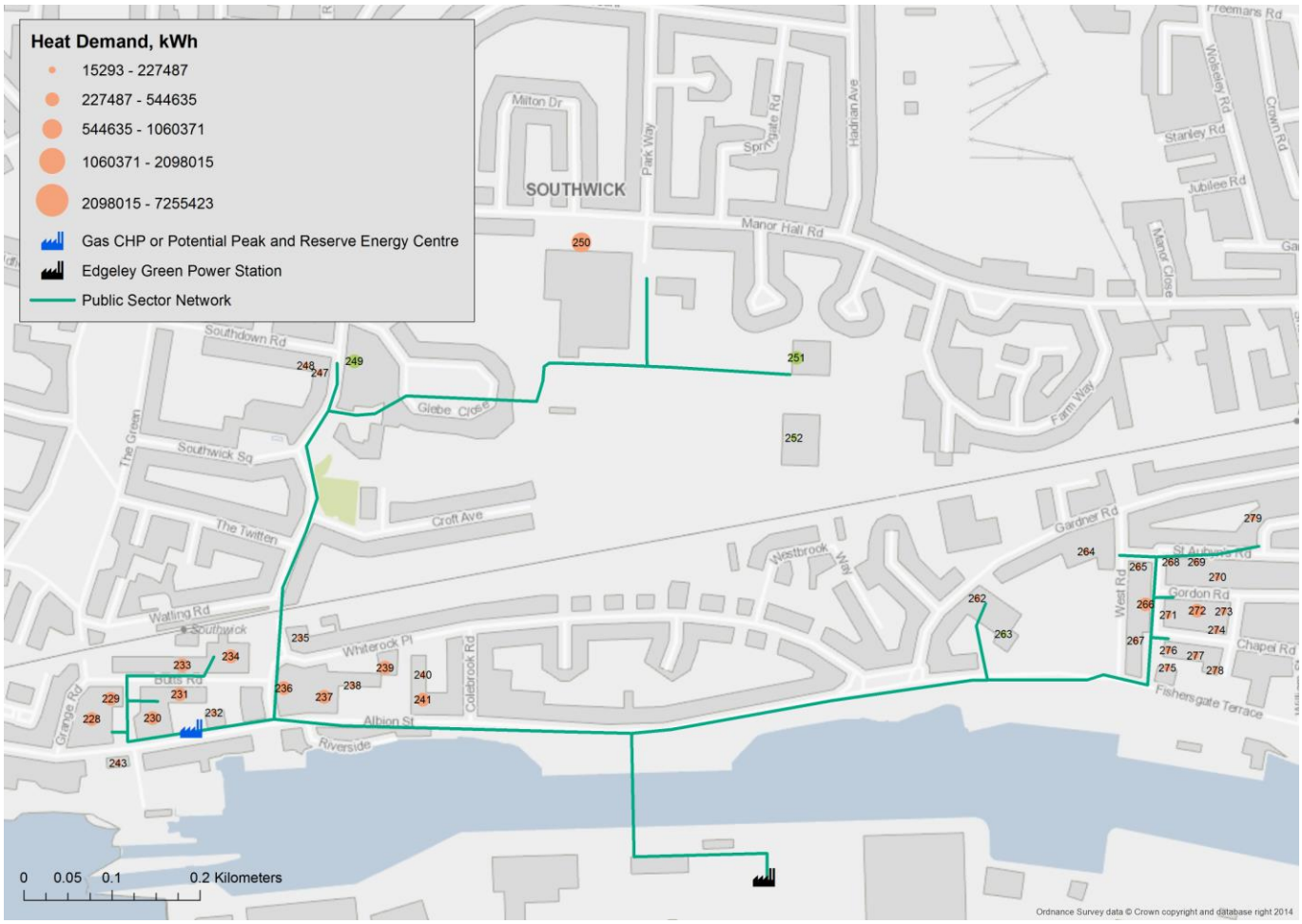
Site ID	Building Name	Existing/Planned Development	Building Use	Ownership	Heat Demand, kWh	Electricity demand, kWh	Peak Heat Demand, kW	Energy data source for heat modelling and profiling
393	Lovegrove Court, flats 1-28	Existing	Social housing	BHCC	544,635	129,360	252	CIBSE Guide F - Residential and nursing homes
394	Lovegrove Court, flats 29-54	Existing	Social housing	BHCC	440,154	104,544	204	CIBSE Guide F - Residential and nursing homes
395	Ingram Court	Existing	Social housing	Adur Homes	206,183	48,972	95	CIBSE Guide F - Residential and nursing homes
396	Ingram Court, flats 1-38	Existing	Social housing	Adur Homes	648,560	154,044	300	CIBSE Guide F - Residential and nursing homes
397	King Alfred Leisure Centre Development	Planned Development	Mixed use	Planned development	7,255,423	2,364,273	2,760	CIBSE Guide F - Offices - naturally ventilated and CIBSE Guide F Residential and nursing homes
398	Western Harbour Arm Stage 2 Employment 5	Planned Development	Retail	Planned development	23,760	23,825	13	CIBSE Guide F - Retail - high street agencies
399	Western Harbour Arm Stage 2 Employment 6	Planned Development	Retail	Planned development	23,760	23,825	13	CIBSE Guide F - Retail - high street agencies
400	Western Harbour Arm Stage 2 Employment 7	Planned Development	Retail	Planned development	23,760	23,825	13	CIBSE Guide F - Retail - high street agencies
401	Western Harbour Arm Stage 2 Employment 8	Planned Development	Retail	Planned development	23,760	23,825	13	CIBSE Guide F - Retail - high street agencies
402	Western Harbour Arm Stage 2 Flats 7	Planned Development	Private residential	Planned development	756,660	158,576	309	CIBSE Guide F - Residential and nursing homes
403	Western Harbour Arm Stage 2 Flats 8	Planned Development	Private residential	Planned development	724,747	151,888	296	CIBSE Guide F - Residential and nursing homes
404	Western Harbour Arm Stage 2 Housing 5	Planned Development	Private residential	Planned development	431,972	90,530	176	CIBSE Guide F - Residential and nursing homes
405	Western Harbour Arm Stage 2 Housing 6	Planned Development	Private residential	Planned development	401,005	84,040	164	CIBSE Guide F - Residential and nursing homes
406	Western Harbour Arm Stage 2 Housing 7	Planned Development	Private residential	Planned development	365,313	76,560	149	CIBSE Guide F - Residential and nursing homes
407	Western Harbour Arm Stage 2 Housing 8	Planned Development	Private residential	Planned development	302,853	63,470	124	CIBSE Guide F - Residential and nursing homes
408	Western Harbour Arm Stage 3 Flats 1	Planned Development	Private residential	Planned development	697,874	146,256	285	CIBSE Guide F - Residential and nursing homes
409	Western Harbour Arm Stage 3 Flats 2	Planned Development	Private residential	Planned development	744,903	156,112	304	CIBSE Guide F - Residential and nursing homes
410	Western Harbour Arm Stage 3 Flats 3	Planned Development	Private residential	Planned development	994,323	208,384	406	CIBSE Guide F - Residential and nursing homes

Site ID	Building Name	Existing/Planned Development	Building Use	Ownership	Heat Demand, kWh	Electricity demand, kWh	Peak Heat Demand, kW	Energy data source for heat modelling and profiling
411	Western Harbour Arm Stage 3 Flats 4	Planned Development	Private residential	Planned development	962,411	201,696	393	CIBSE Guide F - Residential and nursing homes
412	Western Harbour Arm Stage 3 Flats 5	Planned Development	Private residential	Planned development	945,615	198,176	386	CIBSE Guide F - Residential and nursing homes
413	Western Harbour Arm Stage 3 Flats 6	Planned Development	Private residential	Planned development	985,925	206,624	402	CIBSE Guide F - Residential and nursing homes
414	Western Harbour Arm Stage 3 Flats 7	Planned Development	Private residential	Planned development	1,085,861	227,568	443	CIBSE Guide F - Residential and nursing homes
415	Western Harbour Arm Stage 3 Flats 8	Planned Development	Private residential	Planned development	712,990	149,424	291	CIBSE Guide F - Residential and nursing homes
416	Western Harbour Arm Stage 3 Flats 9	Planned Development	Private residential	Planned development	628,170	131,648	256	CIBSE Guide F - Residential and nursing homes
417	Western Harbour Arm Stage 3 Flats 10	Planned Development	Private residential	Planned development	1,060,667	222,288	433	CIBSE Guide F - Residential and nursing homes
418	Western Harbour Arm Stage 3 Flats 11	Planned Development	Private residential	Planned development	954,853	200,112	390	CIBSE Guide F - Residential and nursing homes
419	Western Harbour Arm Stage 3 Flats 12	Planned Development	Private residential	Planned development	881,790	184,800	360	CIBSE Guide F - Residential and nursing homes
420	Western Harbour Arm Stage 3 Flats 13	Planned Development	Private residential	Planned development	941,416	197,296	384	CIBSE Guide F - Residential and nursing homes
421	Western Harbour Arm Stage 3 Flats 14	Planned Development	Private residential	Planned development	866,674	181,632	354	CIBSE Guide F - Residential and nursing homes
422	Western Harbour Arm Stage 3 Flats 15	Planned Development	Private residential	Planned development	376,230	78,848	154	CIBSE Guide F - Residential and nursing homes

APPENDIX 3 – PUBLIC SECTOR NETWORK ASSESSMENT

Network Summary

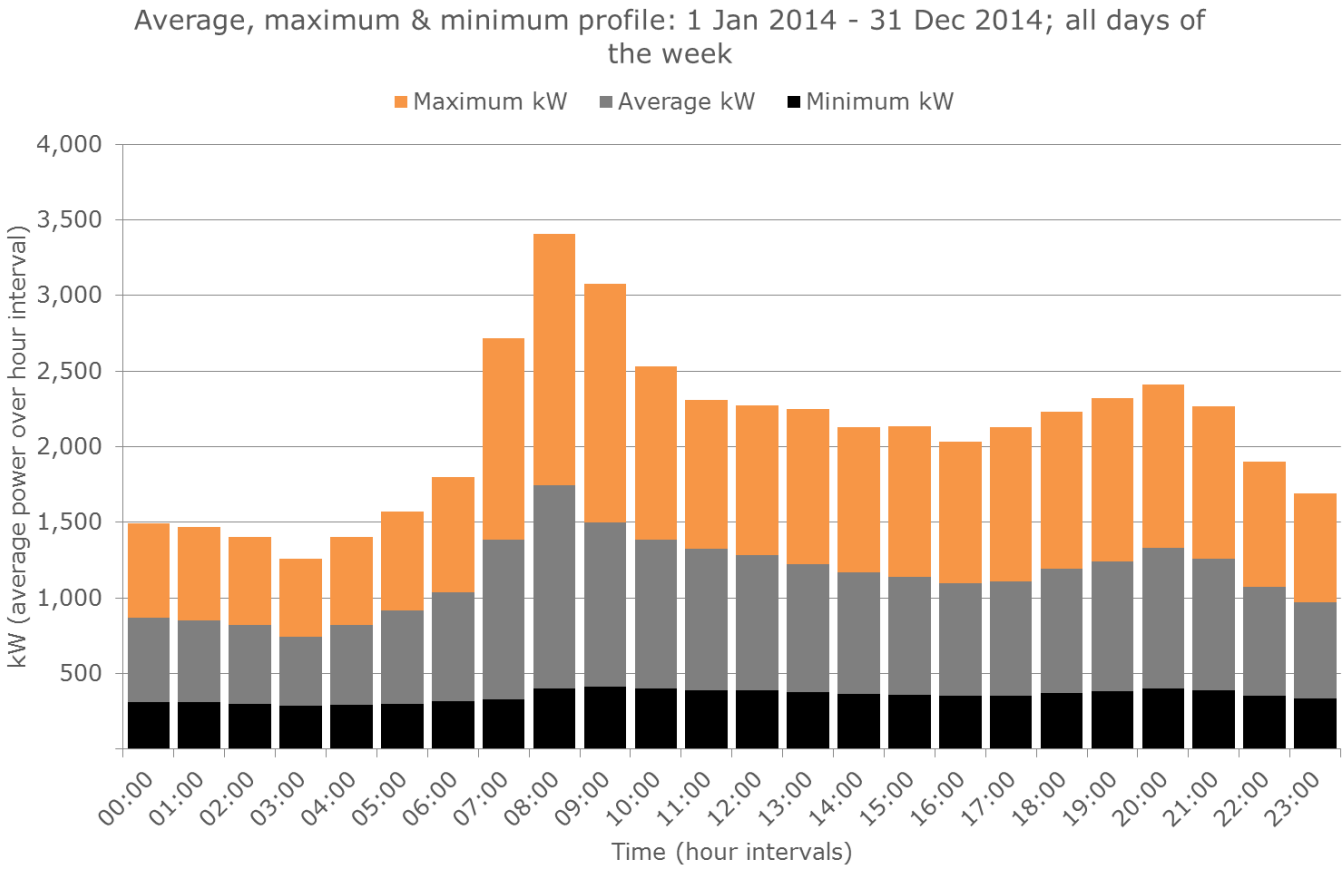
No. heat loads	Trench length	Total heat demand	Peak heat demand	Heat losses	Key heat loads
39	3.7 km	8,340 MWh	3.4 MW	16%	- Eastbrook Primary Academy (North site) - Watling Court, building 2 - Westlands Court, building 2 - Grange Court - Sea House



Site ID	Building Name	Site ID	Building Name
228	Locks Court	252	Indoor Bowling Club
229	Grange Court	262	Stepping Stones Children Family Centre, Council Health Centre
230	Coates Court, building 1	263	Community Centre Fishergate
231	Coates Court, building 2	264	Eastbrook Primary Academy (South Site)
232	Coates Court, building 3	265	Westlands Court, building 1
233	Watling Court, building 2	266	Westlands Court, building 2
234	Watling Court, building 1	267	Westlands Court, building 3
235	Spring Gardens	268	5-8 Laylands road
236	Rock Close, building 2	269	Wyck Court, building 1
237	Rock Close, building 1	270	Wyck Court, building 2
238	Channel View	271	Laylands Court, building 1
239	Sea House	272	Laylands Court, building 2
240	Harbour Court	273	Laylands Court, building 3
241	Albion House	274	Laylands Court, building 4
243	Nautilus House, Port Authority Offices	275	Old Mill Close, building 1
247	Doctors Surgery, Manor Practise	276	Old Mill Close, building 2
248	Southwick Library	277	Old Mill Close, building 3
249	Southwick Community Association	278	Old Mill Close, building 4
250	Eastbrook Primary Academy (North site)	279	Summer Close
251	Leisure Centre		

Hourly demand profile

The figure below shows the average, maximum and minimum hourly heat demand profile for the public sector network. The peak heat demand during the year is approximately 3.4MW and the peak average demand is 1.7MW both occurring at 8am.



Technology appraisal

The results from the technology appraisal for the public sector network is shown in the table below.

Technology	Gas CHP	Edgeley Green Power
Heat output	2 MW	25 MW
% heat supplied by technology	98%	95%
% heat supplied by peak and reserve	2%	5%
Electrical output	1.8 MW	N/A
Capital expenditure	£5,464,623	£3,742,841
IRR	0%	5%
Net present value	-£1,861,991	£556,310
Payback	25 years	16 years
25 year income	£5,710,099	£6,814,068
Carbon savings	2,312 tonnes	1,842 tonnes

Energy Centre
The peak and reserve energy centre for this network will require a land area of 25m^2. This land area does not consider significant further expansion of the network. The peak and reserve energy centre could either be located adjacent to Edgeley Green Power Station or potentially on WSCC along Albion Street. For the gas CHP, an energy centre of 60m^2 would be needed.

Timescale
This phase could be developed by 2025.

Key Network Risks and Considerations
It is likely that both network options are unviable. The financial case for gas CHP is very weak, whereas the network demands for the small scheme are not significant enough to allow EGPS to realise the financial benefits required to incentivise them to provide low cost heat (in relation to the requirements of CHPQA).

The 16% heat losses for the network do not comply with best practice stated in the CIBSE / ADE Heat Networks: Code of Practice for the UK.

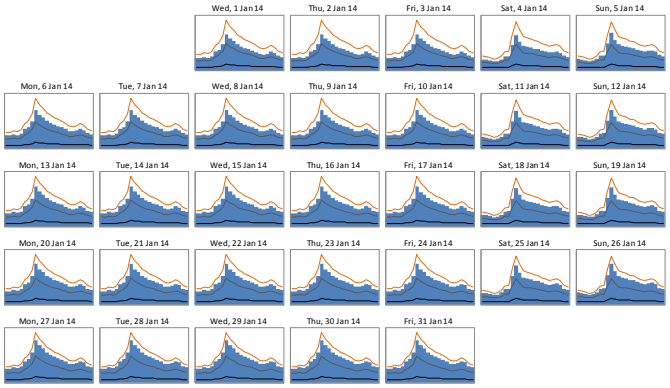
Crossing the railway line the serve relatively small heat demands may also prove problematic and unviable.

APPENDIX 4 – HEAT DEMAND MODELLING

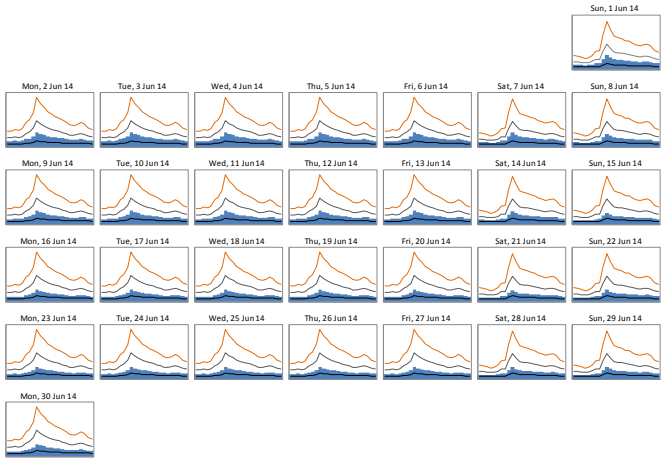
Seasonal Demand Profiles

The heat demand profiles for priority networks for each day of the week, for two separate months, are shown in the figures below. The black, grey and orange lines indicate minimum, average and maximum respectively.

Scenario A Phase 1

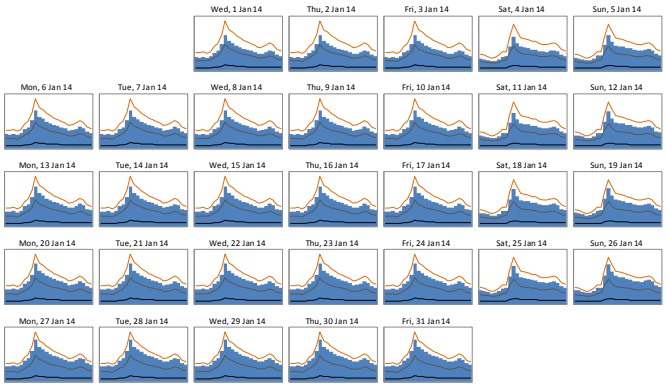


All chart scales run from 0 to 25,034.40 kW (average power over hour interval). Maximum, average, and minimum profiles are included for each day of the week.

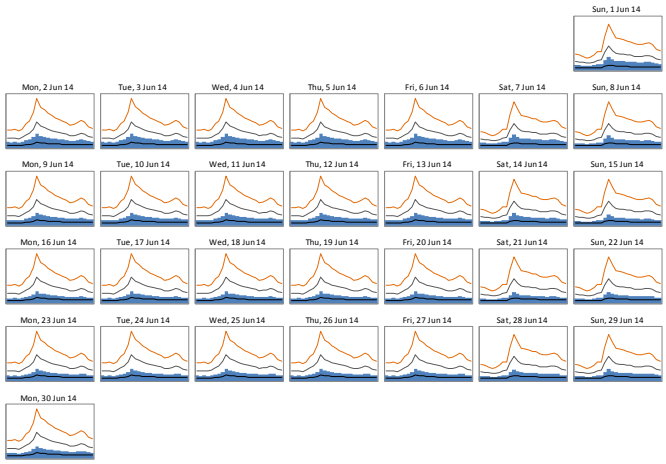


All chart scales run from 0 to 25,034.40 kW (average power over hour interval). Maximum, average, and minimum profiles are included for each day of the week.

Scenario A Phase 2

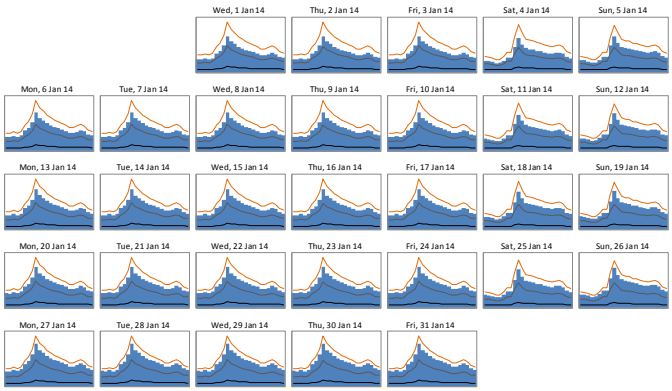


All chart scales run from 0 to 39,242.68 kW (average power over hour interval). Maximum, average, and minimum profiles are included for each day of the week.

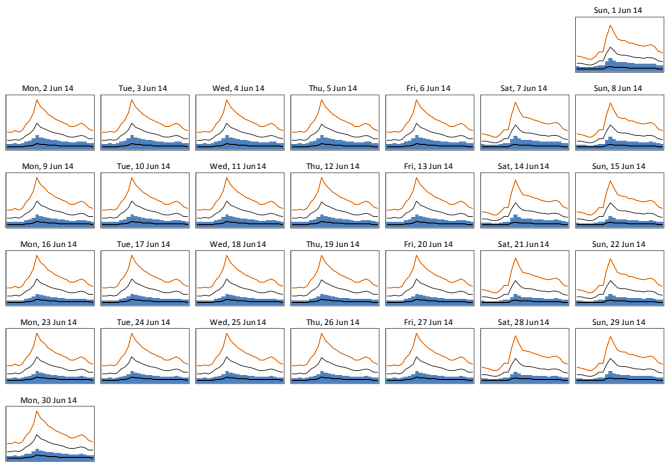


All chart scales run from 0 to 39,242.68 kW (average power over hour interval). Maximum, average, and minimum profiles are included for each day of the week.

Scenario A Phase 3

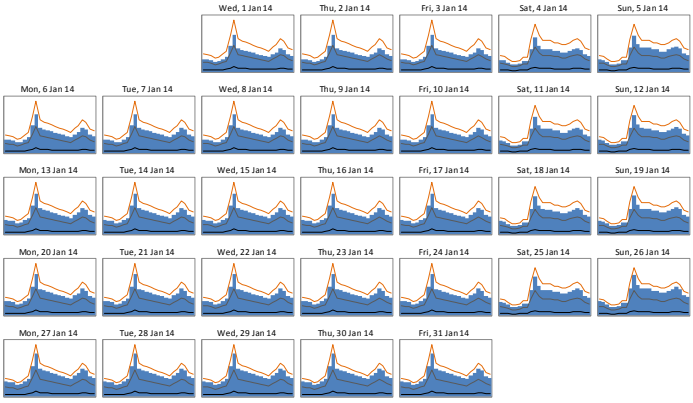


All chart scales run from 0 to 57,117.33 kW (average power over hour interval). Maximum, average, and minimum profiles are included for each day of the week.

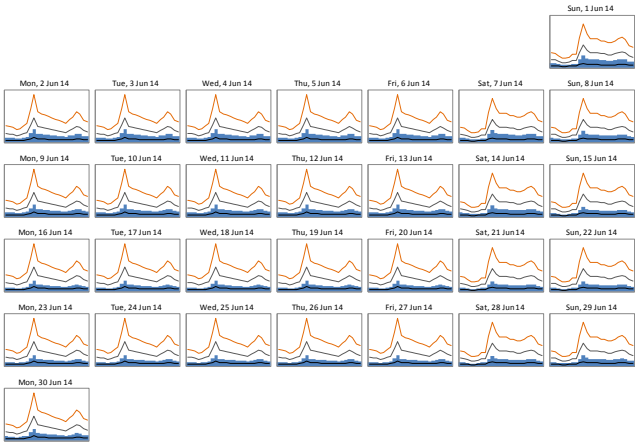


All chart scales run from 0 to 57,117.33 kW (average power over hour interval). Maximum, average, and minimum profiles are included for each day of the week.

Scenario B Phase 1a

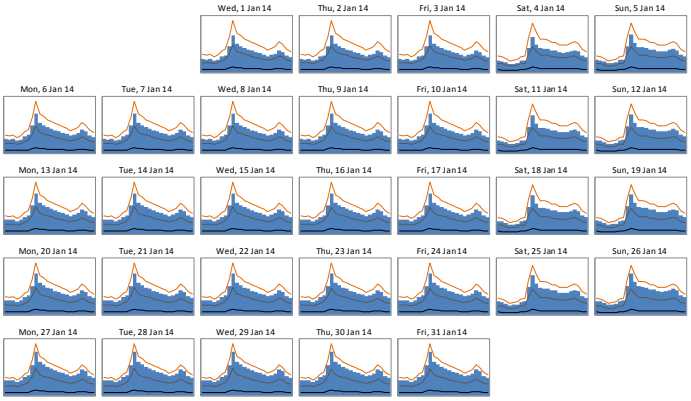


All chart scales run from 0 to 8,509.72 kW (average power over hour interval). Maximum, average, and minimum profiles are included for each day of the week.

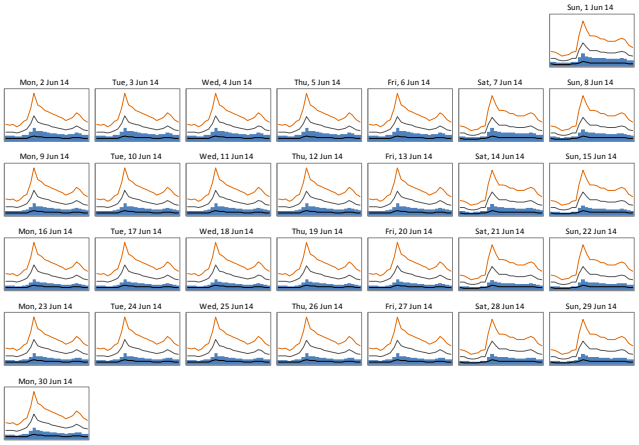


All chart scales run from 0 to 8,509.72 kW (average power over hour interval). Maximum, average, and minimum profiles are included for each day of the week.

Scenario B Phase 1b

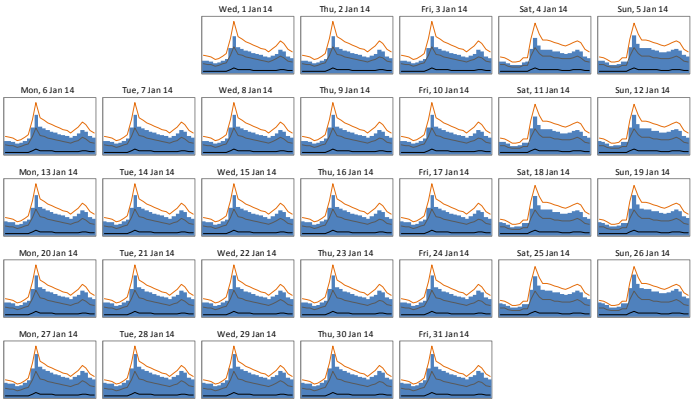


All chart scales run from 0 to 14,544.31 kW (average power over hour interval). Maximum, average, and minimum profiles are included for each day of the week.

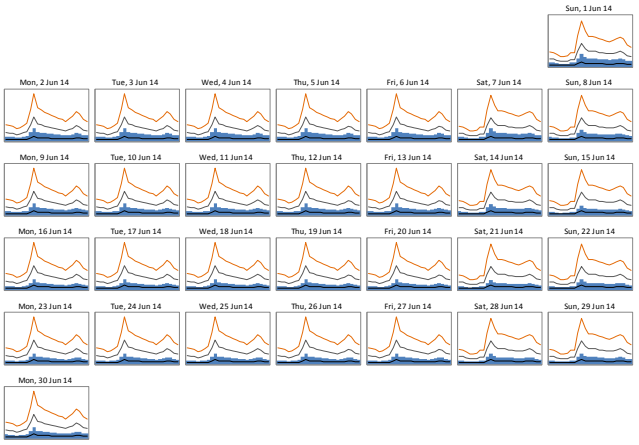


All chart scales run from 0 to 14,544.31 kW (average power over hour interval). Maximum, average, and minimum profiles are included for each day of the week.

Scenario B Phase 2

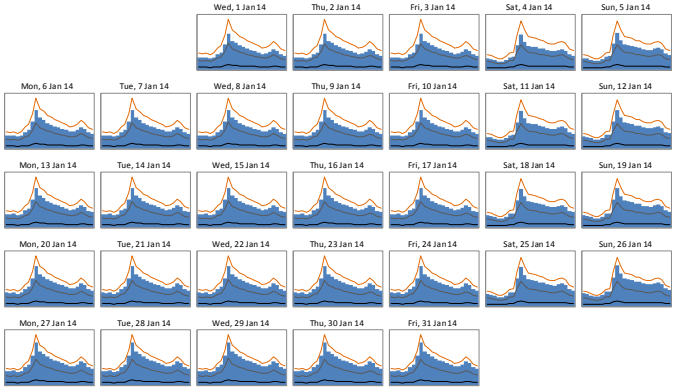


All chart scales run from 0 to 22,708.87 kW (average power over hour interval). Maximum, average, and minimum profiles are included for each day of the week.

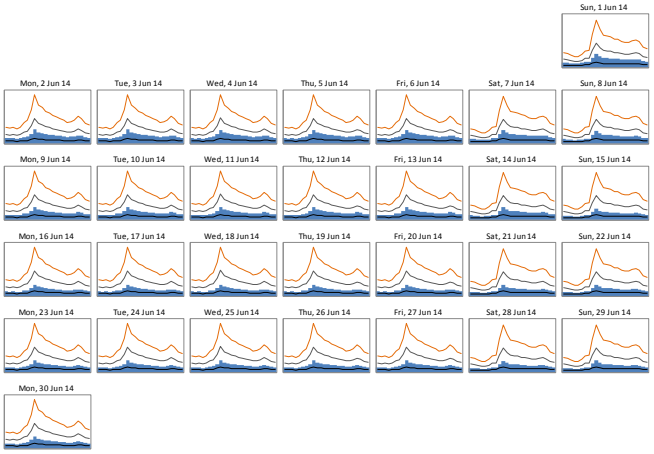


All chart scales run from 0 to 22,708.87 kW (average power over hour interval). Maximum, average, and minimum profiles are included for each day of the week.

Scenario B Phase 3

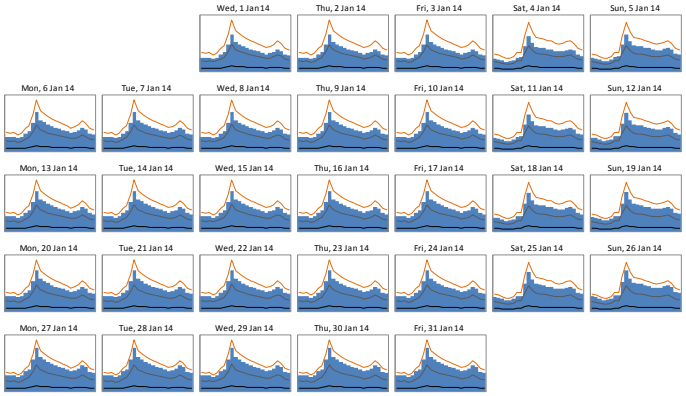


All chart scales run from 0 to 32,561.90 kW (average power over hour interval). Maximum, average, and minimum profiles are included for each day of the week.

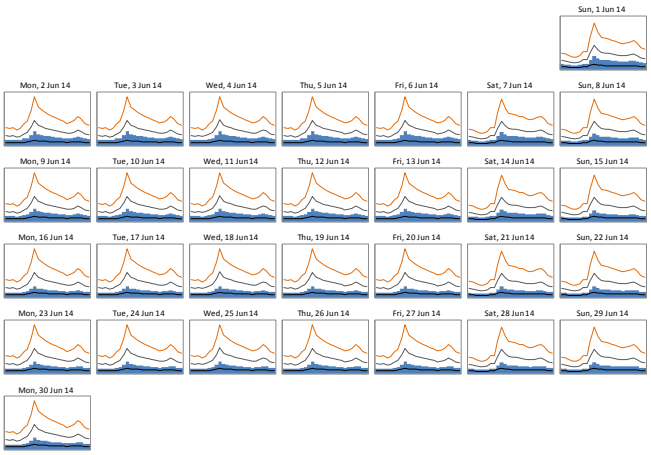


All chart scales run from 0 to 32,561.90 kW (average power over hour interval). Maximum, average, and minimum profiles are included for each day of the week.

Scenario B Phase 4



All chart scales run from 0 to 46,754.28 kW (average power over hour interval). Maximum, average, and minimum profiles are included for each day of the week.



All chart scales run from 0 to 46,754.28 kW (average power over hour interval). Maximum, average, and minimum profiles are included for each day of the week.

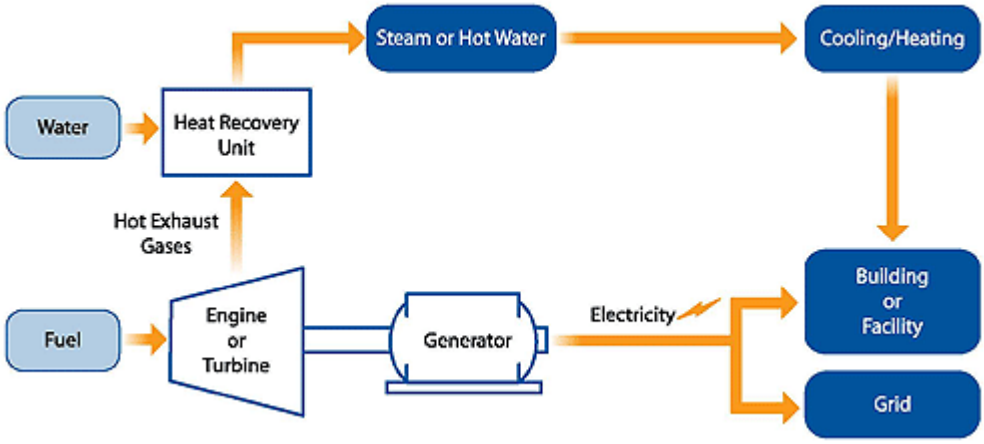
APPENDIX 5 – INTRODUCTION TO TECHNOLOGIES ASSESSED

Biomass Boiler – a biomass boiler burns wood fuel in the form of wood pellets, chips or logs to provide heat in the form of low temperature, medium temperature hot water or steam. A biomass boiler comprises two main parts, the combustion chamber where wood fuel is combusted with unrestricted oxygen and the boiler tubes which transfer heat from the combustion chamber to the water or steam medium. The heated water or steam is then distributed around the heating system as required.

6MW Wood Chip Boiler at Sawmill Site in Mid-Wales, Photo Courtesy of Sustainable Energy Ltd

Wood Chip Delivery to Wood Chip Store for 6MW Biomass Boiler, Photo Courtesy of Sustainable Energy Ltd

Natural Gas Combined heat and power (CHP) – CHP is an efficient way of generating electricity and useful thermal energy from a single fuel source (natural gas). CHP is used to either replace or supplement conventional separate heat and power; instead of purchasing electricity from the local utility and burning fuel in a boiler to produce heat, a CHP plant provides both energy services in one step. CHP involves the recovery of otherwise-wasted useful thermal energy. Normally, fuel is combusted in a prime mover such as a gas turbine or reciprocating gas engine to generate electricity. Energy normally lost in the prime mover's hot exhaust and cooling systems is instead recovered to provide heating for applications such as space heating, cooling, hot water and industrial processes. CHP plants are normally located at or near the electricity consumers, whereas conventional generation takes place in large centrally located power plants. CHP's higher efficiency comes from recovering the heat normally lost in power generation to provide heating or cooling on site. CHP's inherent higher efficiency and elimination of transmission and distribution losses from the central power plant results in reduced primary energy use and lower greenhouse gas emissions.

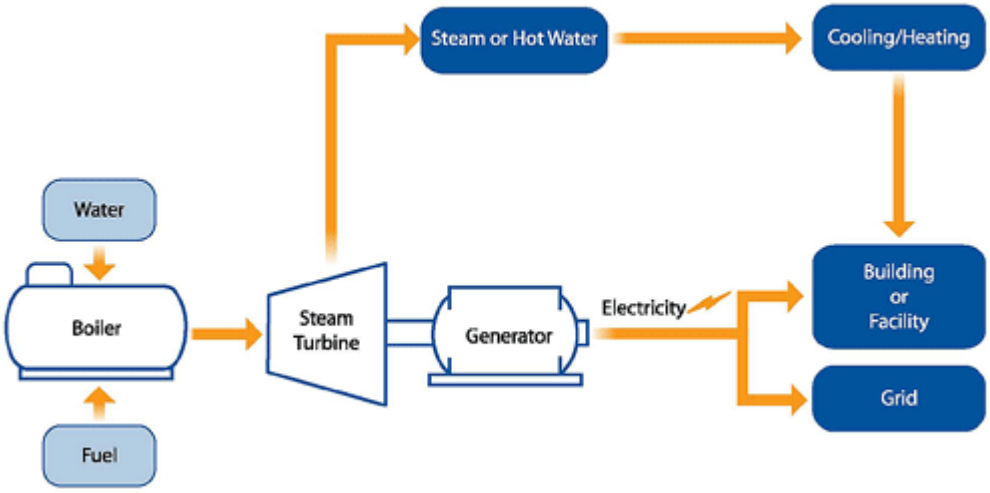


Picture courtesy of www.epa.gov

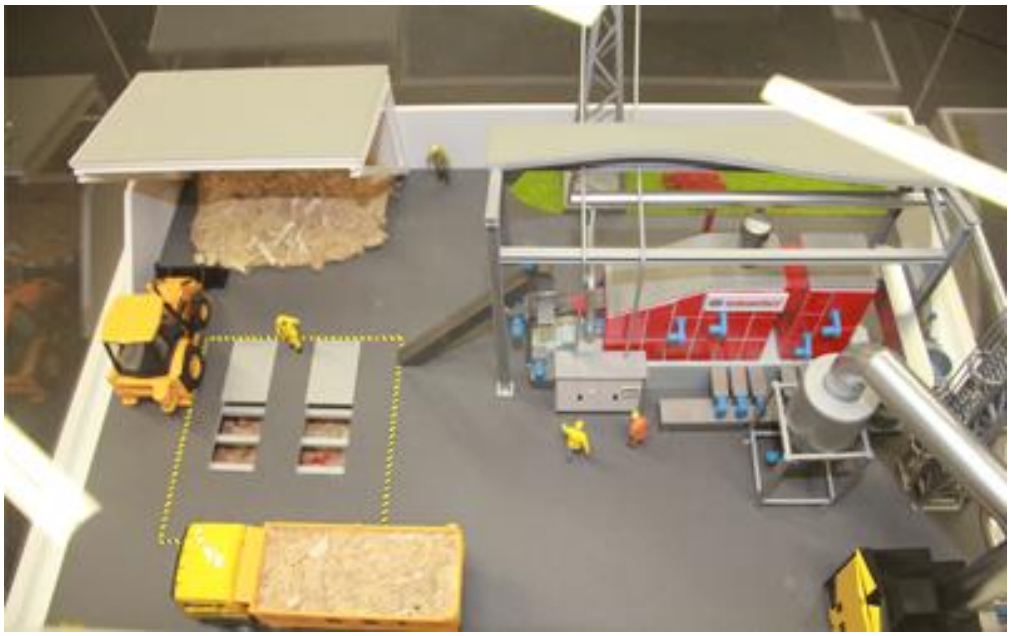
400kWe Natural Gas CHP Plant. Photo Courtesy of www.viessmann.co.uk

Biofuels CHP - Cogeneration from biomass fuels can be achieved by three means, medium to large scale steam turbine systems; smaller scale ORC systems and advanced thermal conversion with gas engines systems.

Biomass Steam Turbine CHP – This utilises biomass in the form of wood chip, wood pellet or bio oils as a fuel source for a boiler which is then used to raise steam which drives a steam turbine to generate electricity, with heat recovered from the steam turbine's exhaust and cooling systems to provide useable heat.



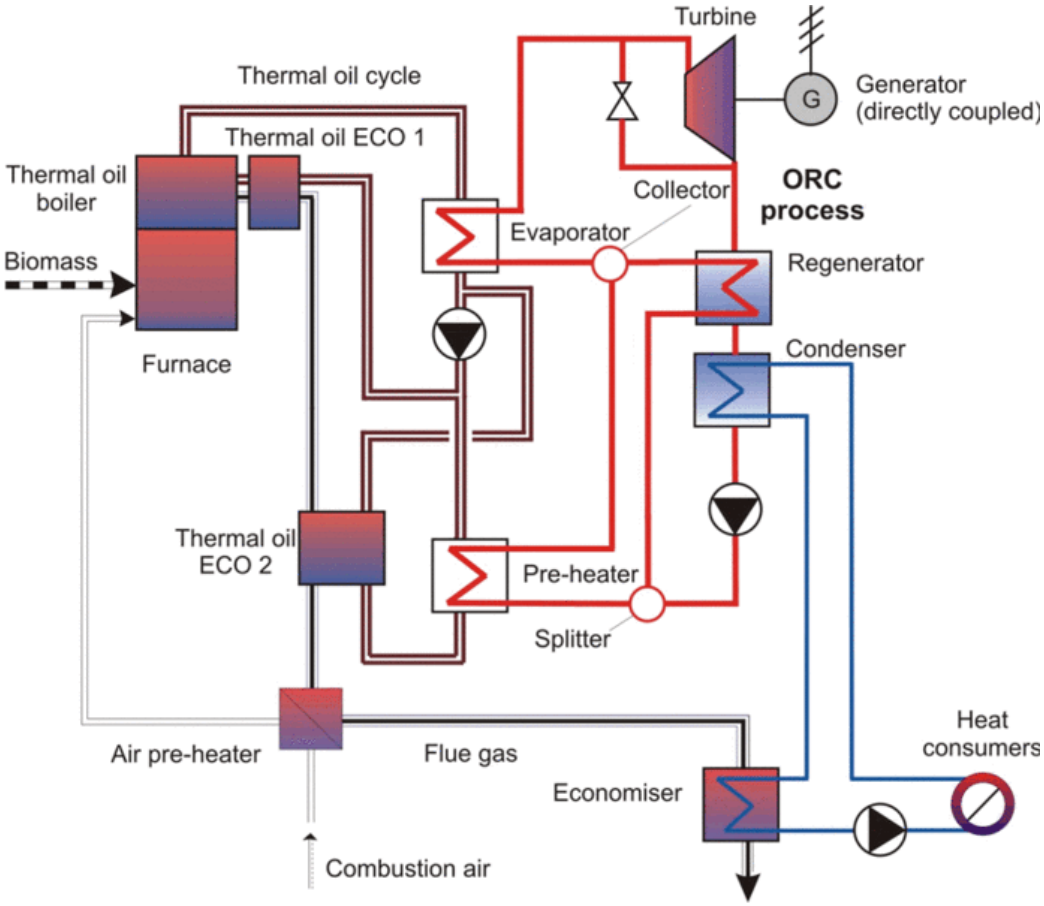
Picture courtesy of www.epa.gov



130kWe Biomass CHP Plant, Photo Courtesy of www.environltd.co.uk

Biomass Organic Rankine Cycle CHP (ORC) – Reciprocating steam engines and steam turbines use a thermodynamic process called the Rankine Cycle. At small scale, this is inefficient due to the high temperatures and pressures involved. However, it is possible to replace water as the working medium with an organic compound with a lower boiler point, such as a silicone oil or organic solvent. This allows the system to work at much lower temperatures, pressures and at smaller scale. The working medium is usually less corrosive than water to components such as turbine blades and the turbine can operate at a lower speed which can improve reliability. CHP systems where biomass fuel is used to produce heat in order to evaporate an organic compound to drive a turbine are known as Organic Rankine Cycle systems.

Picture courtesy of www.endswasteandbioenergy.com



Picture Courtesy of www.bios-bioenergy.at

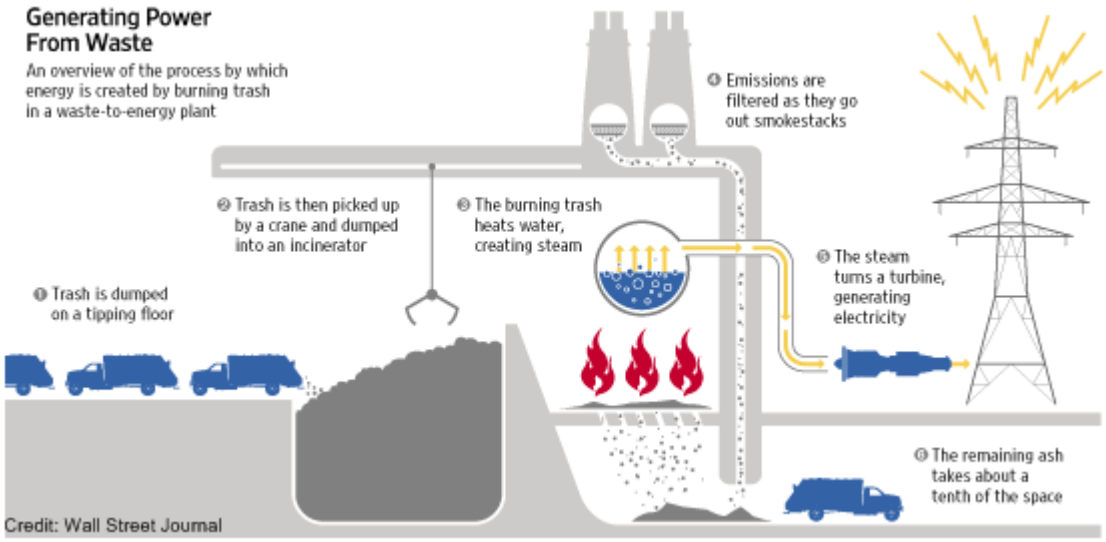
Biomass Gasification CHP – For Biomass Gasification CHP, instead of wood fuel being combusted to raise steam to generate electricity via a steam turbine, the wood fuel is burned with restricted oxygen levels to produce a wood gas which is then combusted within an internal combustion engine. The engine is then used to generate electricity, with heat recovered from the engine's exhaust and cooling systems to provide useable heat.

250kWe Wood Gasification System, Photo Courtesy of Sustainable Energy Ltd

The temperatures of the usable heat available from different CHP systems depends on the type of prime mover used. Higher flow temperatures can be achieved from engines for gas CHP and biomass gasification CHP or ORC systems whereas fully condensing steam turbines will not generate temperatures suitable for district heat systems unless electrical efficiency is sacrificed to achieve higher flow temperatures. Indicative flow temperatures for different CHP technologies are shown below:

	Internal Combustion Engine	**ORC**	**Steam turbine – full condensing**
Flow Temperature	80°C to 90°C	80°C to 90°C	40°C to 50°C
Potential Thermal efficiency	55%	50% to 60%	60% to 70%
Use as LTHW	Yes	Yes	No

Energy from Waste – Energy from Waste plants burn waste to generate electricity via a prime mover such as steam turbine or engine. The waste normally combusted in such plants is the residual waste from Municipal Solid Waste which is left over after all recycling possible has been done. This waste is normally a mix of items made from oil such as plastics and items that are biodegradable such as paper, wood and food. The most common thermal treatment for waste is incineration; waste is incinerated and the heat produced is used to heat water to raise steam which then drives a turbine and generates electricity. Significant amounts of heat are generated in this process which are often dumped, but this could be used to provide a heat source for a district heating scheme by recovering the heat from the exhaust and cooling systems of the steam turbine. Advanced thermal conversion processes such as gasification and pyrolysis can also be used to generate electricity from waste; by converting the waste into a product such as oil or gas that can then be burnt directly in gas engines or turbines. Advanced thermal conversion systems are potentially more efficient but are technically difficult and relatively unproven at commercial scale.



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APPENDIX 6 – FINANCIAL VIABILITY ASSESSMENTS AND NETWORK COSTS

Scenario A: Edgeley Green Power Station

Scenario A, Phase 1

Estimated Capital Costs

Cost of auxiliary & plant equipment	£2,047,500
Cost of DH network	£15,307,889
Cost of connection to existing buildings	£934,433
Total cost of scheme	£18,289,822

Financial Viability Assessment

Phase heat demand (MWh)	50,157
District heat network losses (MWh)	6,845
Total amount of heat generated (MWh)	57,003
Size of auxiliary (kW)	19500
Heat offtake from EGPS (MWh)	53,879
Heat generation from auxiliary gas (MWh)	3,124
Value of heat sales	£1,755,511
Total Income	
Cost of heat purchased	£269,396
Cost of fuel for auxiliary (gas)	£91,868
Cost of operation and maintenance for auxiliary	£9,371
Auxiliary replacement costs	£0
Cost of energy centre operation	£92,629
Cost of network operation and maintenance	£59,750
Total costs of generation	**£523,013**
Net income	**£1,232,498**

Scenario A phase 1 25 year financial case

Capital costs	£18,289,822
Internal rate of return	7%
Net present value	£8,271,631
Payback	13 years
25 year income	£42,099,368

Scenario A phase 1 40 year financial case

Capital costs	£18,289,822
Internal rate of return	8%
Net present value	£20,386,849
Payback	14 years
40 year income	£81,003,395

Scenario A, Phase 2

Estimated Capital Costs

Cost of auxiliary & plant equipment	£3,192,000
Cost of DH network	£23,847,872
Cost of connection to existing buildings	£1,311,501

Total cost of scheme	£28,351,373

Financial Viability Assessment

Phase heat demand (MWh)	81,639
District heat network losses (MWh)	10,767
Total amount of heat generated (MWh)	92,405
Size of auxiliary (kW)	30,400
Heat offtake from EGPS (MWh)	86,952
Heat generation auxiliary gas (MWh)	5,453
Value of heat sales	£2,857,355
Total Income	
Cost of heat purchased	£434,762
Cost of fuel for auxiliary (gas)	£160,384
Cost of operation and maintenance for auxiliary	£16,359
Auxiliary replacement costs	£0
Cost of energy centre operation	£150,159
Cost of network operation and maintenance	£74,970
Total costs of generation	**£836,633**
Net income	**£2,020,721**

Scenario A phase 2 25 year financial case

Capital costs	£28,351,373
Internal rate of return	7%
Net present value	£15,197,019
Payback	13 years
25 year income	£69,023,323

Scenario A phase 2 40 year financial case

Capital costs	£28,351,373
Internal rate of return	9%
Net present value	£35,139,949
Payback	13 years
40 year income	£132,974,545

Scenario A, Phase 3

Estimated Capital Costs

Cost of auxiliary & plant equipment	£4,651,500
Cost of DH network	£32,412,511
Cost of connection to existing buildings	£1,930,795
Total cost of scheme	£38,994,806

Financial Viability Assessment

Phase heat demand (MWh)	117,876
District heat network losses (MWh)	15,267
Total amount of heat generated (MWh)	133,143
Size of auxiliary (kW)	44,300
Heat offtake from EGPS (MWh)	120,282
Heat generation auxiliary gas (MWh)	12,861
Value of heat sales	£4,125,665
Total Income	
Cost of heat purchased	£601,410
Cost of fuel for auxiliary (gas)	£378,277

Cost of operation and maintenance for auxiliary	£38,584
Auxiliary replacement costs	£0
Cost of energy centre operation	£216,358
Cost of network operation and maintenance	£110,611
Total costs of generation	**£1,345,241**
Net Income	**£2,780,424**

Scenario A phase 3 25 year financial case

Capital costs	£38,994,806
Internal rate of return	7%
Net present value	£20,925,870
Payback	13 years
25 year income	£94,973,063

Scenario A phase 3 40 year financial case

Capital costs	£38,994,806
Internal rate of return	9%
Net present value	£48,241,221
Payback	13 years
40 year income	£182,704,827

Scenario B: Alternative Networks

Scenario B, Phase 1a - MSHP

Estimated Capital Costs

Cost of MSHP	£3,300,000
Cost of auxiliary & plant equipment	£756,000
Cost of DH network	£2,179,305
Cost of connection to existing buildings	£0
Total cost of scheme	£6,235,305

Financial Viability Assessment

Phase heat demand (MWh)	16,378
District heat network losses (MWh)	928
Total amount of heat generated by MSHP (MWh)	16,016
Size of auxiliary (kW)	7,200
Heat generation auxiliary gas (MWh)	1,337
Value of heat sales	£573,219
RHI	£643,451
Total Income	**£1,216,670**
Cost of MSHP electricity	£377,712
Cost of operation and maintenance of MSHP	£168,000
MSHP replacement costs	£26,400
Cost of fuel for auxiliary (gas)	£39,338
Cost of operation and maintenance for auxiliary	£4,012
Cost of energy centre operation	£0
Cost of network operation and maintenance	£8,698
Total costs of generation	**£652,360**
Net income	**£564,310**

Scenario B phase 1a MSHP 25 year financial case

Capital costs	£6,235,305
Internal rate of return	9%
Net present value	£3,415,218
Payback	10 years
25 year income	£13,733,444

Scenario B phase 1a MSHP 40 year financial case

Capital costs	£6,235,305
Internal rate of return	6%
Net present value	£976,423
Payback	11 years
25 year income	£7,755,420

Scenario B, Phase 1a – Gas CHP

Estimated Capital Costs

Cost of CHP plant	£1,887,900
Cost of auxiliary & plant equipment	£756,000
Cost of DH network	£2,179,305
Cost of private wire network	£204,200
Cost of connection to existing buildings	£0
Total cost of scheme	£5,027,405

Financial Viability Assessment

Phase heat demand (MWh)	16,378
District heat network losses (MWh)	928
Total amount of heat generated (MWh)	17,306
Size of CHP (kWth)	3000
Size of CHP (kWe)	2697
CHP modulation limit	25%
Size of auxiliary (kW)	7,200
Heat generation CHP (MWh)	15,431
Heat generation auxiliary gas (MWh)	1,875
CHP electrical generation per annum (MWh)	13,872
Value of heat sales	£573,219
CCL	£64,592
Electricity sales (private wire)	£387,538
Electricity sales (export)	£443,971
Total Income	**£1,469,320**
Cost of gas for CHP	£836,687
Cost of operation for CHP	£104,042
Cost of fuel for auxiliary (gas)	£55,135
Cost of operation and maintenance for auxiliary	£5,624
Cost of energy centre operation	£28,122
Cost of network operation and maintenance	£8,698
Total costs of generation	**£1,078,583**
Net income	**£390,737**

Scenario B phase 1a CHP 25 year financial case

Capital costs	£5,027,405
Internal rate of return	8%
Net present value	£3,393,328

Payback	12 years
25 year income	£13,346,692

Scenario B phase 1a CHP 40 year financial case

Capital costs	£5,027,405
Internal rate of return	7%
Net present value	£4,968,662
Payback	15 years
40 year income	£23,470,066

Scenario B, Phase 1b – MSHP and CHP

Estimated Capital Costs

Cost of MSHP	£3,300,000
Cost of CHP plant	£1,708,100
Cost of auxiliary & plant equipment	£1,186,500
Cost of DH network	£7,277,594
Cost of private wire network	£204,200
Cost of connection to existing buildings	£405,070
Total cost of scheme	£14,081,464

Financial Viability Assessment

Phase heat demand (MWh)	29,024
District heat network losses (MWh)	3,272
Total amount of heat generated (MWh)	32,296
Size of CHP (kWth)	3,000
Size of CHP (kWe)	2,697
CHP modulation limit	25%
Size of MSHP	3,000
MSHP modulation limit	25%
Size of auxiliary (kW)	11,300
Heat generation CHP (MWh)	7,869
Heat generation MSHP (MWh)	22,310
Heat generation auxiliary gas (MWh)	2,118
CHP electrical generation per annum (MWh)	7,074
Value of heat sales	£1,015,849
CCL	£32,936
Electricity sales (private wire)	£387,538
Electricity sales (export)	£138,029
RHI	£773,708
Total Income	**£2,348,060**
Cost of gas for CHP	£426,633
Cost of operation for CHP	£53,052
CHP replacement costs	£40,994
Cost of MSHP electricity	£516,301
Cost of operation of MSHP	£168,000
MSHP replacement costs	£26,400
Cost of fuel for auxiliary (gas)	£62,297
Cost of operation for auxiliary	£6,354
Auxiliary replacement costs	£0
Cost of energy centre operation	£52,481
Cost of network operation and maintenance	£26,835
Total costs of generation	**£1,379,348**
Net income	**£968,713**

Scenario B phase 1b MSHP and CHP 25 year financial case

Capital costs	£14,081,464
Internal rate of return	6%
Net present value	£3,776,026
Payback	13 years
25 year income	£26,425,029

Scenario B phase 1b MSHP and CHP 40 year financial case

Capital costs	£14,081,464
Internal rate of return	-2%
Net present value	-£10,394,999
Payback	>25 years
40 year income	£7,720,835

Scenario B, Phase 1b – Gas CHP

Estimated Capital Costs

Cost of CHP plant	£3,416,200
Cost of auxiliary & plant equipment	£1,186,500
Cost of DH network	£7,277,594
Cost of private wire network	£817,700
Cost of connection to existing buildings	£405,070
Total cost of scheme	£13,103,064

Financial Viability Assessment

Phase heat demand (MWh)	29,024
District heat network losses (MWh)	3,272
Total amount of heat generated (MWh)	32,296
Size of CHP (kWth)	6,000
Size of CHP (kWe)	5,394
CHP modulation limit	25%
Size of auxiliary (kW)	11,300
Heat generation CHP (MWh)	30,639
Heat generation auxiliary gas (MWh)	1,658
CHP electrical generation per annum (MWh)	27,543
Value of heat sales	£1,015,849
CCL	£128,247
Electricity sales (private wire)	£676,771
Electricity sales (export)	£924,610
Total Income	**£2,745,476**
Cost of gas for CHP	£1,661,226
Cost of operation for CHP	£206,573
CHP replacement costs	£81,989
Cost of fuel for auxiliary (gas)	£48,753
Cost of operation for auxiliary	£4,973
Auxiliary replacement costs	£0
Cost of energy centre operation	£52,481
Cost of network operation and maintenance	£26,835
Total costs of generation	**£2,082,831**
Net income	**£662,646**

Alternative network phase 1b gas CHP 25 year financial case

Capital costs	£13,103,064
Internal rate of return	4%
Net present value	£1,177,553
Payback	17 years
25 year income	£22,634,491

Alternative network phase 1b gas CHP 40 year financial case

Capital costs	£13,103,064
Internal rate of return	6%
Net present value	£6,165,652
Payback	18 years
40 year income	£40,355,889

Scenario B, Phase 1b –Biomass

Estimated Capital Costs

Cost of biomass boiler	£5,520,000
Cost of auxiliary & plant equipment	£1,186,500
Cost of DH network	£7,277,594
Cost of connection to existing buildings	£405,070
Total cost of scheme	£14,389,164

Financial Viability Assessment

Phase heat demand (MWh)	29,024
District heat network losses (MWh)	3,272
Total amount of heat generated (MWh)	32,296
Size of biomass boiler (kW)	6,000
Biomass boiler modulation limit	25%
Size of auxiliary (kW)	11,300
Heat generation biomass (MWh)	29,553
Heat generation auxiliary gas (MWh)	2,743
Value of heat sales	£1,015,849
Total Income	**£1,555,004**
Cost of fuel for biomass	£1,292,959
Cost of operation and maintenance for biomass	£443,300
Biomass replacement costs	£44,160
Cost of fuel for auxiliary (gas)	£80,671
Cost of operation for auxiliary	£8,228
Auxiliary replacement costs	£0
Cost of energy centre operation	£53,289
Cost of network operation and maintenance	£26,835
Total costs of generation	**£1,949,442**
Net income	**-£394,438**

Scenario B phase 1b biomass 25 year financial case

Capital costs	£ 14,389,164
Internal rate of return	N/A
Net present value	-£23,040,733
Payback	>25 years
25 year income	-£18,116,918

Scenario B phase 1b biomass 40 year financial case

Capital costs	£ 14,389,164
Internal rate of return	N/A
Net present value	-£31,321,935
Payback	>25 years
40 year income	-£54,818,344

Scenario B, Phase 1b – Biofuel CHP

Estimated Capital Costs

Cost of auxiliary & plant equipment	£1,186,500
Cost of DH network	£7,277,594
Cost of connection to existing buildings	£405,070
Total cost of scheme	£8,869,164

Financial Viability Assessment

Phase heat demand (MWh)	29,024
District heat network losses (MWh)	3,272
Total amount of heat generated (MWh)	32,296
Size of auxiliary (kW)	11,300
Heat offtake from Biofuels CHP (MWh)	30,544
Heat generation auxiliary gas (MWh)	1,753
Value of heat sales	£1,015,849
Total Income	**£1,015,849**
Cost of fuel for auxiliary (gas)	£51,546
Cost of operation for auxiliary	£5,258
Auxiliary replacement costs	£0
Cost of energy centre operation	£52,481
Cost of network operation and maintenance	£26,835
Total costs of generation	**£288,838**
Net income	**£727,011**

Scenario B phase 1b Biofuels CHP 25 year financial case

Capital costs	£8,869,164
Internal rate of return	9%
Net present value	£6,798,594
Payback	11 years
25 year income	£24,833,081

Scenario B phase 1b Biofuels CHP 40 year financial case

Capital costs	£8,869,164
Internal rate of return	10%
Net present value	£13,955,238
Payback	12 years
40 year income	£47,802,823

Scenario B, Phase 2 – Gas CHP

Estimated Capital Costs

Cost of CHP plant	£5,124,300
Cost of auxiliary & plant equipment	£1,816,500
Cost of DH network	£7,634,607
Cost of private wire network	£817,700
Cost of connection to existing buildings	£405,070
Total cost of scheme	£15,798,177

Financial Viability Assessment

Phase heat demand (MWh)	44,985
District heat network losses (MWh)	3,595
Total amount of heat generated (MWh)	48,581
Size of CHP (kWth)	9,000
Size of CHP (kWe)	8,091
CHP modulation limit	25%
Size of auxiliary (kW)	17,300
Heat generation CHP (MWh)	45,822
Heat generation auxiliary gas (MWh)	2,758
CHP electrical generation per annum (MWh)	41,193
Value of heat sales	£1,574,489
CCL	£191,803
Electricity sales (private wire)	£676,745
Electricity sales (export)	£1,538,866
Total Income	**£3,981,903**
Cost of gas for CHP	£2,484,501
Cost of operation for CHP	£308,948
CHP replacement costs	£122,983
Cost of fuel for auxiliary (gas)	£81,118
Cost of operation for auxiliary	£8,274
Auxiliary replacement costs	£0
Cost of energy centre operation	£78,943
Cost of network operation and maintenance	£33,729
Total costs of generation	**£3,118,496**
Net income	**£863,407**

Scenario B phase 2 CHP 25 year financial case

Capital costs	£15,798,177
Internal rate of return	5%
Net present value	£2,809,033
Payback	16 years
25 year income	£29,492,053

Scenario B phase 2 CHP 40 year financial case

Capital costs	£15,798,177
Internal rate of return	6%
Net present value	£8,885,342
Payback	17 years
40 year income	£51,696,509

Scenario B, Phase 2 – Biofuel CHP

Estimated Capital Costs

Cost of auxiliary & plant equipment	£1,816,500
Cost of DH network	£7,634,607
Cost of connection to existing buildings	£405,070
Total cost of scheme	£9,856,177

Financial Viability Assessment

Phase heat demand (MWh)	44,985
District heat network losses (MWh)	3,595
Total amount of heat generated (MWh)	48,581
Size of auxiliary (kW)	17,300
Heat offtake from Biofuels CHP (MWh)	45,945
Heat generation auxiliary gas (MWh)	2,636
Value of heat sales	£1,574,489
Total Income	**£1,574,489**
Cost of fuel for auxiliary (gas)	£77,525
Cost of operation for auxiliary	£7,908
Auxiliary replacement costs	£0
Cost of energy centre operation	£78,943
Cost of network operation and maintenance	£33,729
Total costs of generation	**£427,828**
Net income	**£1,146,661**

Scenario B phase 2 Biofuels CHP source 25 year financial case

Capital costs	£9,856,177
Internal rate of return	13%
Net present value	£14,855,413
Payback	8 years
25 year income	£39,167,372

Scenario B phase 2 Biofuels CHP 40 year financial case

Capital costs	£9,856,177
Internal rate of return	14%
Net present value	£26,159,409
Payback	9 years
40 year income	£75,430,090

Scenario B, Phase 3 – Gas CHP

Estimated Capital Costs

Cost of CHP plant	£7,401,767
Cost of auxiliary & plant equipment	£2,635,500
Cost of DH network	£13,834,945
Cost of private wire network	£817,700
Cost of connection to existing buildings	£882,440
Total cost of scheme	£25,572,352

Financial Viability Assessment

Phase heat demand (MWh)	65,043
District heat network losses (MWh)	6,656

Total amount of heat generated (MWh)	71,699
Size of CHP (kWth)	13,000
Size of CHP (kWe)	11,687
CHP modulation limit	25%
Size of auxiliary (kW)	25,100
Heat generation CHP (MWh)	67,406
Heat generation auxiliary gas (MWh)	4,293
CHP electrical generation per annum (MWh)	60,596
Value of heat sales	£2,276,514
CCL	£282,147
Electricity sales (private wire)	£2676,745
Electricity sales (export)	£2,411,987
Total Income	**£5,647,393**
Cost of gas for CHP	£3,654,748
Cost of operation for CHP	£454,468
CHP replacement costs	£177,642
Cost of fuel for auxiliary (gas)	£126,273
Cost of operation for auxiliary	£12,880
Auxiliary replacement costs	£0
Cost of energy centre operation	£116,511
Cost of network operation and maintenance	£60,394
Total costs of generation	**£4,602,916**
Net income	**£1,044,477**

Scenario B phase 3 CHP 25 year financial case

Capital costs	£25,572,352
Internal rate of return	2%
Net present value	-£3,062,915
Payback	20 years
25 year income	£35,677,004

Scenario B phase 3 CHP 40 year financial case

Capital costs	£25,572,352
Internal rate of return	4%
Net present value	£302,742
Payback	24 years
40 year income	£54,192,111

Scenario B, Phase 3 – Biofuel CHP

Estimated Capital Costs

Cost of auxiliary & plant equipment	£2,635,500
Cost of DH network	£13,834,945
Cost of connection to existing buildings	£882,440
Total cost of scheme	£17,352,885

Financial Viability Assessment

Phase heat demand (MWh)	65,043
District heat network losses (MWh)	6,656
Total amount of heat generated (MWh)	71,699
Size of auxiliary (kW)	25,100
Heat offtake from Biofuels CHP (MWh)	67,378
Heat generation auxiliary gas (MWh)	4,321
Value of heat sales	£2,276,514

Total Income	**£2,276,514**
Cost of fuel for auxiliary (gas)	£127,093
Cost of operation for auxiliary	£12,963
Auxiliary replacement costs	£0
Cost of energy centre operation	£116,511
Cost of network operation and maintenance	£60,394
Total costs of generation	**£653,850**
Net income	**£1,622,664**

Scenario B phase 3 Biofuels CHP 25 year financial case

Capital costs	£17,352,885
Internal rate of return	10%
Net present value	£17,617,009
Payback	10 years
25 year income	£55,426,578

Scenario B phase 3 Biofuels CHP source 40 year financial case

Capital costs	£17,352,885
Internal rate of return	11%
Net present value	£33,596,533
Payback	10 years
40 year income	£106,707,115

Scenario B, Phase 4 – Gas CHP

Estimated Capital Costs

Cost of CHP plant	£10,817,967
Cost of auxiliary & plant equipment	£3,790,500
Cost of DH network	£22,631,806
Cost of private wire network	£817,700
Cost of connection to existing buildings	£1,324,892
Total cost of scheme	£39,382,866

Financial Assessment

Phase heat demand (MWh)	96,525
District heat network losses (MWh)	10,450
Total amount of heat generated (MWh)	106,975
Size of CHP (kWth)	19,000
Size of CHP (kWe)	17,081
CHP modulation limit	25%
Size of auxiliary (kW)	36,100
Heat generation CHP (MWh)	100,890
Heat generation auxiliary gas (MWh)	6,085
CHP electrical generation per annum (MWh)	90,697
Value of heat sales	£3,378,364
CCL	£422,306
Electricity sales (private wire)	£676,745
Electricity sales (export)	£3,766,558
Total Income	**£8,243,972**
Cost of gas for CHP	£5,470,283
Cost of operation for CHP	£680,230
CHP replacement costs	£259,631
Cost of fuel for auxiliary (gas)	£178,968
Cost of operation for auxiliary	£18,255

Auxiliary replacement costs	£0
Cost of energy centre operation	£173,835
Cost of network operation and maintenance	£81,613
Total costs of generation	**£6,862,814**
Net income	**£1,381,158**

Scenario B phase 4 CHP 25 year financial case

Capital costs	£39,382,866
Internal rate of return	1%
Net present value	-£9,617,650
Payback	22 years
25 year income	£47,177,267

Scenario B phase 4 CHP 40 year financial case

Capital costs	£39,382,866
Internal rate of return	3%
Net present value	-£1,463,553
Payback	25 years
40 year income	£79,417,590

Scenario B, Phase 4 – Biofuel CHP

Estimated Capital Costs

Cost of auxiliary & plant equipment	£3,790,500
Cost of DH network	£21,630,825
Cost of connection to existing buildings	£1,324,892
Total cost of scheme	£26,746,217

Financial Assessment

Phase heat demand (MWh)	96,525
District heat network losses (MWh)	10,450
Total amount of heat generated (MWh)	106,975
Size of auxiliary (kW)	36,100
Heat offtake from Biofuels CHP (MWh)	96,826
Heat generation auxiliary gas (MWh)	10,149
Value of heat sales	£3,378,364
Total Income	**£3,378,364**
Cost of fuel for auxiliary (gas)	£298,499
Cost of operation for auxiliary	£30,447
Auxiliary replacement costs	£0
Cost of energy centre operation	£173,835
Cost of network operation and maintenance	£81,613
Total costs of generation	**£1,068,525**
Net income	**£2,309,839**

Scenario B phase 4 Biofuels CHP 25 year financial case

Capital costs	£26,746,217
Internal rate of return	9%
Net present value	£23,032,923
Payback	11 years
25 year income	£78,898,935

Scenario B phase 4 Biofuels CHP 40 year financial case

Capital costs	£26,746,217
Internal rate of return	11%
Net present value	£45,760,764
Payback	11 years
40 year income	£151,856,705

Pipe Sizing

Scenario A

Pipe Size	Pipe length, m		
	Phase 1	Phase 2	Phase 3
DN40	3320	4812	8864
DN50	0	0	0
DN100	0	980	1793
DN150	3812	3812	10146
DN200	2744	6484	13250
DN250	3790	12226	12226
DN300	5630	5630	5630
DN350	2076	2076	2076
DN400	3292	3292	3292

Scenario B

Pipe Size	Pipe length, m				
	Phase 1a	Phase 1b	Phase 2	Phase 3	Phase 4
DN40	644	1662	3604	5262	6754
DN50	0	0	0	0	980
DN100	0	3812	3812	5832	6692
DN150	724	724	724	724	3604
DN200	0	1186	1186	9420	13364
DN250	0	0	0	0	4492
DN350	2076	4906	4906	4906	4906
DN400	0	462	462	462	462

Pipe Specifications

Pipe Size	Internal diameter, mm	Outer diameter, mm (including insulation)	Trench width, mm	Trench depth, mm	Heat loss, kW/m
DN40	41	160	820	960	19
DN50	53	180	860	980	21
DN100	102	280	1060	1080	25
DN150	154	355	1210	1155	31
DN200	203	450	1400	1250	32
DN250	255	560	1620	1360	32
DN300	305	630	1760	1430	36
DN350	337	710	1920	1510	34
DN400	387	800	2100	1600	35