

Climate Action, Environment & Highways Policy and Scrutiny Committee

Date of meeting:	29 th February 2024
Classification:	General Release
Title:	PDHU – Outline Business Case Approach
Report of:	Debbie Jackson, Executive Director – Regeneration, Economy & Planning
Cabinet Member Portfolio	Cabinet Member for Housing Services Cabinet Member for Climate, Ecology and Culture
Wards Involved:	Pimlico South Pimlico North
Policy Context:	Fairer Housing Fairer Environment
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1. Executive Summary

- 1.1. This report provides a summary of progress with the Outline Business Case (OBC), overview of the heat sources being considered and pipework replacement options for the future of PDHU project. The report also provides an overview of the ongoing activities around resident engagement and key dates for 2024.
- 1.2. The project was last presented to Policy and Scrutiny Committee on 2nd March 2023. This was following approval of the Strategic Outline Case (SOC) and provided the Committee with a summary of the SOC and next steps for procuring consultancy support and advancing with the Outline Business Case.
- 1.3. A proposed approach to funding a future project was presented to the Budget Scrutiny Committee on 25th January 2024.

2. Key Matters for the Committee's Consideration

- 2.1. This report is coming to this Committee for pre-decision scrutiny to obtain input on the current approach to developing the Outlines Business Case and ultimately selecting a preferred option for the future of PDHU.
- 2.2. The Core questions Committee are asked to provide a response to are:
 - Does the Committee agree with the current approach to identifying and selecting a preferred option?
 - The OBC will consider a range of options (including innovative technology) that are showing potential to provide low carbon and affordable heat, such as SWAN and the thermal battery solution. Do you agree this is worthwhile considering the long time impact of any decisions made?
 - Does the Committee agree with the proposed approach to financing the project outlined in Section 4?

3. Background, including policy context

- 3.1. Pimlico District Heat Undertaking (PDHU) is a district heating system which provides heating and hot water to 3,306 residential properties and more than 50 commercial properties ranging from schools, offices, a library and shops.
- 3.2. PDHU is supplied with heat from an Energy Centre which is located at the Pump House in Churchill Gardens Estate.
- 3.3. PDHU is the oldest heat network in the United Kingdom, dating back to the 1950s. The distribution pipework has significantly exceeded its design life, leaks are a persistent issue and it is critically important that the network is renewed to maintain a secure supply of heat to residents.
- 3.4. PDHU was developed and built in the post-war period to help address poor air quality in Central London, it has been supplying affordable energy to residents since 1950. Originally, the PDHU made use of waste heat from the nearby Battersea Power Station. The heat was pumped through a tunnel under the Thames and was distributed to the homes in Churchill Gardens.
- 3.5. The network has expanded over time, with connection to Lillington and Longmoore Gardens in 1983 and Abbots Manor 2004. There have also been a number of commercial connections including Pimlico Academy in 2009.
- 3.6. The network is currently powered by three 8MW natural gas boilers which emit 16k Tonnes of CO₂ per annum, this equates to 39% of the Council's total carbon emissions in 2021/22. Two of these boilers were installed in 2005 and one was installed in 2021.

- 3.7. Energy expenditure for operating PDHU has increased from £1.3m in 21/22 to £3m in 23/24 due to rising global energy costs.
- 3.8. Due to the age of the pipework, 50 – 70 years old, leaks are a significant issue. The system design makes identifying and isolating leaks problematic resulting in significant disruption to residents through loss of heating and damage to property. In addition, the existing pipework is not energy efficient, resulting in high levels of energy loss, with a lack of control available for residents.
- 3.9. The Business Case will be exploring the potential options for replacement of the distribution pipework, this includes:
- Costed options for pipework routes across all the connected estates, including architectural and structural impact
 - Assessment of requirement for in dwelling pipework upgrades including provision of dwelling level heating controls and metering
 - Pre planning consultation with planning authorities, to determine feasibility of pipework replacement options
- 3.10. In addition, the UK Government have announced plans to appoint Ofgem as the new regulator for Heat Networks under the Energy Act. This is expected to bring in significant changes to the heat network sector. Operators of the heat networks will need to comply with enhanced performance requirements and consumer protections that are anticipated for existing and future customers, which will be enforced by Ofgem. WCC are reviewing the implications of this as the new legislation emerges.

Strategic Outline Case

- 3.11. In January 2023, a Strategic Outline Case (SOC) was presented to, and endorsed by, the Capital Review Group (CRG). This SOC outlined the rationale for significant investment in PDHU. A copy of the SOC has been included in the appendices for reference.
- 3.12. The SOC identified a range of potential options for the future of PDHU to include in the OBC and requested a budget of £1.2m to appoint a multi-disciplinary design team. The following options were shortlisted, with option 5 not considered viable due to high future energy tariffs for residents:

Option 1a
Installation of 7.5MW Centralized River Source Heat Pumps with Gas Boilers providing top up at the existing PDHU pump house
Option 1b
Installation of 7.5MW Centralized River Source Heat Pumps with Electric Boilers providing top up at the existing PDHU pump house
Option 3a
Install RSHP at existing energy centre with electric boilers for peak demand. Zone Lillington and Longmoore, to be supplied by electric boiler
Option 3b
Install RSHP at existing energy centre with electric boilers for peak demand. Zone Lillington and Longmoore, to be supplied by electric boiler and heat pump using TFL waste heat
Option 5
Decommission PDHU and install direct electric heating by storage heaters with hot water supplied by immersion coils

- 3.13. The intention for the OBC was to revisit the full long list of ‘blue sky’ options, to ensure there were no viable options missed in the SOC process. This includes revisiting the option for replacing the existing heat network with direct electric heating in dwellings.
- 3.14. The SOC also outlined a proposed governance structure for the OBC, which includes an operational project board to review progress and cabinet member steering group.
- 3.15. The SOC approved a budget of £1.2m, funded through a combination of the Community Infrastructure Levy (CIL) and grant funding from the Heat Network Delivery Unit (£180,000)

Outline Business Case

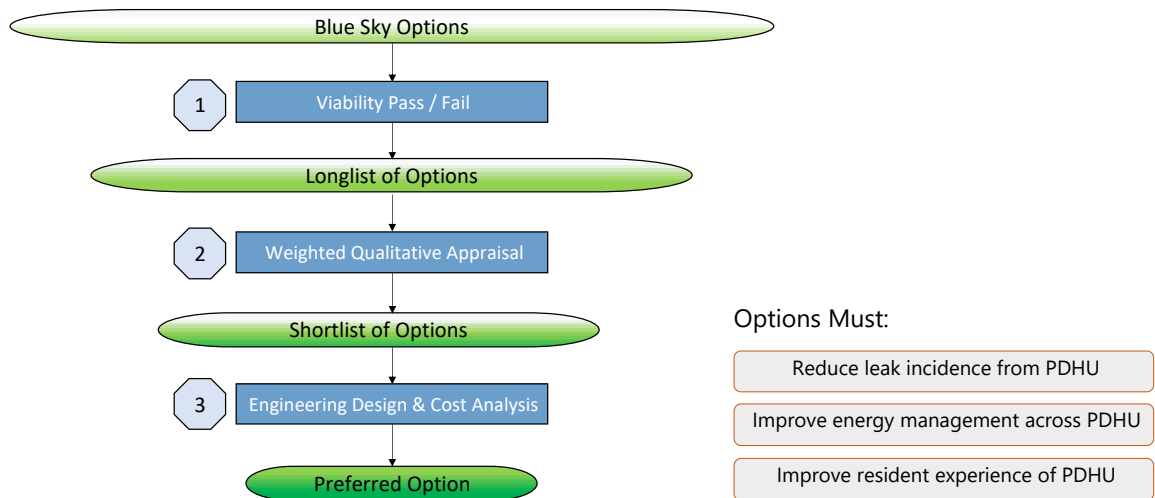
- 3.16. A tender process for appointing a multi-disciplinary design team concluded in August 2023 and production of the Outline Business Case is underway. The project team consists of:
- AECOM – Technical Lead – Responsible for mechanical and electrical engineering, structural engineering, architecture and fire consultancy
 - Turner & Townsend – Development and authoring of the OBC (following the HM Treasury 5 Case Model) and project management services
 - Amberside Advisors – Financial Modelling and heat tariff advice
- 3.17. The project objectives for the OBC (and beyond) have been agreed as follows:
- Improve customer experience over design life of network through reduction of leaks and improvements in heat consistency and availability, in a cost effective way.
 - Improve energy management in line with regulatory requirements by increasing network efficiency through reduction of energy loss and allowing improved control of energy by customers.

- Reduce PDHU's annual carbon emissions in line with WCC's Net Zero Strategy and WCC's strategic objectives, within 1 year of project completion.

Heat Source Options

3.18. A key first step for AECOM was to restart the options appraisal process completed during the Strategic Outline Case. The diagram below shows the process being followed to identify a preferred heat source option:

Preferred option identification process



3.19. A total of 33 heat source options were identified in the 'blue sky' list of heating options and assessed for their technical viability. This included a number of variations across the following technology types:

- River Source Heat Pump
- Air Source Heat Pump
- Ground Source Heat Pump
- Heat Pumps using waste heat (TFL and sewer source)
- Direct heating in flats (gas boiler and electric heating)
- Hydrogen heating

3.20. A total of 11 options passed the technical viability assessment. These options were then scored across a range of criteria. Each of the criteria were weighted based on discussions with the project board and Cabinet Member steering group. These weightings were also influenced by resident feedback from the working group. The current criteria, critical success factors and weightings are shown in the table below (subject to change following further engagement):

Criteria	Critical success factor metrics	Total criteria weighting
Value for money	<ul style="list-style-type: none"> • Project Economic Performance • Operational Cost / Impact to Heat Tariffs • Capital Cost • Whole Life Cost of Heat Generation • Eligibility for Grant Funding Support 	37%
Resident benefit	<ul style="list-style-type: none"> • Impact on Local Air Quality • Disruption to Residents During Works 	11%
Deliverability	<ul style="list-style-type: none"> • Construction Risk • Planning Risk • Reputation Risk • Operational Risk • Space Requirement Availability 	17%
Strategic fit	<ul style="list-style-type: none"> • Reduce maintenance costs • Futureproof / potential for expansion • Impact on Electrical Grid 	5%
Market capability and capacity	<ul style="list-style-type: none"> • Technology Maturity • Commercial Delivery Risk • Reliance on Specialist Contractor Resource 	15%
Carbon Reduction	<ul style="list-style-type: none"> • Lifetime Operational Carbon Emissions • Whole Life Cost per TCO_{2e} Saved • Potential to achieve Net Zero Target 	15%

3.21. Following application of the weightings a shortlist of options has been identified which will be subject to full techno-economic modelling. The table below shows the current options, alongside the current advantages and disadvantages of each:

No	Option	Advantages	Disadvantages
1	Do minimum – Replace pipework and retain gas boilers	<p>Capital costs are expected to be lower due to retention of existing gas boilers.</p> <p>Pipework would be upgraded, resulting in reduced number of leaks and improved efficiency.</p> <p>Increased control for residents, paying only for what they use.</p>	<p>No grant funding available.</p> <p>Carbon savings are minimised due to retention of gas boilers.</p> <p>Increased exposure to future energy price changes due to efficiency of gas boilers.</p> <p>Local air quality impacts due to gas boiler flues.</p> <p>UK Government looking to phase out gas for heating.</p>
2	Direct electric heating installed to dwellings (Option 5 SOC)	<p>Carbon reduction potential due to removal of gas boilers.</p> <p>No leaks due to removal of heating through hot water.</p>	<p>Significantly increased energy bills due to efficiency of heating system, increasing fuel poverty.</p> <p>No grant funding available.</p> <p>Residents would pay for energy directly from energy companies.</p> <p>Reduced space in dwellings due to requirement for hot water cylinder.</p>

<p>3</p>	<p>Retain full network – Install River Source Heat Pump as new energy source and replace all network pipework.</p> <p>(Variations to include gas boilers and electric boilers as back up)</p>	<p>Carbon reduction due to heat pumps providing the main heat source.</p> <p>Increased efficiency of heat provision due to heat pump technology.</p> <p>Pipework would be upgraded, resulting in reduced number of leaks and improved efficiency.</p> <p>Increased control for residents, paying only for what they use.</p>	<p>Operational risk from use of the river as a heat source.</p> <p>The heat pump will be run on electricity which may impact on energy costs for residents.</p> <p>The existing pipework may need to be upgraded in advance to optimise heat pump performance.</p>
<p>4</p>	<p>Zoning option 1: Abbots Manor zoned off and powered by an Air Source Heat Pump, with the remaining properties on the network supplied by a River Source Heat Pump.</p> <p>All network pipework to be replaced.</p>	<p>Carbon reduction due to heat pumps providing the main heat source.</p> <p>Increased efficiency of heat provision due to heat pump technology.</p> <p>Pipework would be upgraded, resulting in reduced number of leaks and improved efficiency.</p> <p>Increased control for residents, paying only for what they use.</p> <p>Reduced disruption to local roads as part of the primary network would not need replacing.</p>	<p>Operational risk from use of the river as a heat source.</p> <p>The heat pump will be run on electricity which may impact on energy costs for residents.</p> <p>Reduced efficiency due to smaller network, with different energy tariffs for each estate.</p> <p>The existing pipework may need to be upgraded to optimise heat pump performance.</p>

<p>5</p>	<p>Zoning option 2 - Lillington and Longmoore Gardens zoned-off and powered from a Waste Heat source (TfL), with the remaining properties on the network supplied by a River Source Heat Pump.</p> <p>All network pipework to be replaced (Option 3b SOC)</p>	<p>Carbon reduction due to the removal of gas boilers.</p> <p>Increased efficiency of heat provision due to heat pump technology.</p> <p>Pipework would be upgraded, resulting in reduced number of leaks and improved efficiency.</p> <p>Increased control for residents, paying only for what they use.</p> <p>Reduced disruption to local roads as part of the primary network would not need replacing.</p>	<p>Operational risk from use of the river and TFL ventilation shaft as a source of heat.</p> <p>The heat pumps will be run on electricity which may impact on annual energy costs for residents.</p> <p>Reduced efficiency due to smaller network, with different energy tariffs for each estate.</p> <p>Contract and offtake agreement will need to be agreed with TFL.</p> <p>The existing pipework may need to be upgraded to optimise heat pump performance.</p>
<p>6</p>	<p>Each of the three large estates zoned-off and supplied with separate low carbon heat source.</p> <p>All network pipework to be replaced</p>	<p>Carbon reduction due to the removal of gas boilers.</p> <p>Increased efficiency of heat provision due to heat pump technology.</p> <p>Pipework would be upgraded, resulting in reduced number of leaks and improved efficiency.</p> <p>Increased control for residents, paying only for what they use.</p>	<p>Operational risk from use of the river and TFL ventilation shaft as a source of heat.</p> <p>The heat pumps will be run on electricity which may impact on annual energy costs for residents.</p> <p>Reduced efficiency due to smaller network, with different energy tariffs for each estate.</p> <p>Contract and offtake agreement will need to be agreed with TFL.</p> <p>Increased maintenance costs across 3 separate communal networks.</p>

		<p>Significantly reduced disruption to local roads as the main feeder network would not need replacing.</p> <p>Increased resilience as there are 3 energy centres.</p>	<p>The existing pipework may need to be upgraded to optimise heat pump performance.</p>
7	<p>Connection to larger South Westminster Area Network (SWAN)</p> <p>All network pipework to be replaced.</p>	<p>Existing energy centre (and potentially primary network) would be taken under control of SWAN, reducing operational and maintenance costs for WCC.</p> <p>Pipework would be upgraded, resulting in reduced number of leaks and improved efficiency.</p> <p>Opportunity to benefit from economies of scale from connection to a larger heat network.</p>	<p>WCC has less control over heat provision and heat tariff pricing.</p> <p>The Pump House site would require extensive redevelopment potentially impacting on heat provision to residents and the local area.</p> <p>The existing pipework may need to be upgraded in advance to optimise performance and heat consumed.</p>
8	<p>Thermal Batteries: Waste heat supplied by Thermal Batteries directly to PDHU</p>	<p>The technology can be rapidly integrated into PDHU to offer a decarbonised source of heat.</p> <p>The heat price being offered by the supplier is competitive when compared to alternatives.</p> <p>The technology can be integrated before significant pipework upgrades across the network.</p>	<p>It is a novel technology when compared to heat pumps or gas boilers.</p> <p>WCC would enter into a long term heat supply agreement (20 years) with a commercial JV.</p>

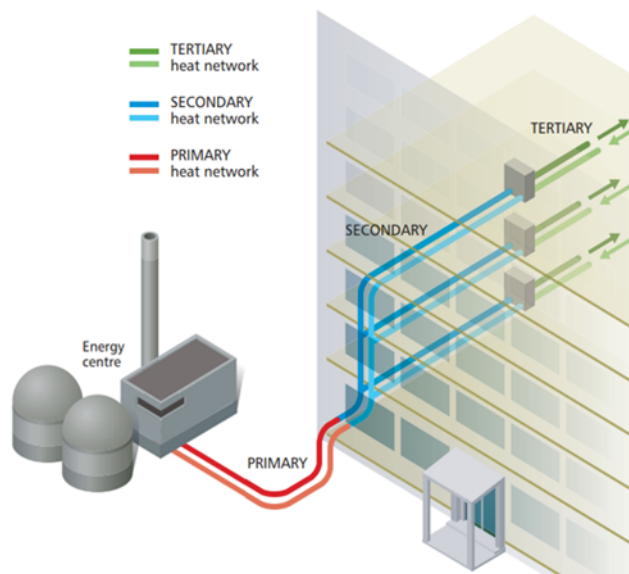
3.22. Option 2 has been re-introduced following a request from residents at the working group. It was initially discounted due the high impact on resident heating bills. The project team will be reviewing the technical and commercial viability for this option to ensure that residents are fully informed on the decision making process. Options 7&8 are potential alternative solutions which are described in further detail below.

Pipework Upgrades

3.23. The process for reviewing the options for upgrading the pipework is different the heat source as the number of options is limited. Nearly all of the current heat source options will require distribution pipework to take the heat from an energy centre into the residential dwellings. The only exception to this is the option to install direct electric heating.

3.24. The existing pipework is split into 3 main categories:

- Primary Network – These are the large diameter distribution pipes which run from the energy centre to the building, they are generally buried under roads and pavements.
- Secondary Network – This is the pipework within the communal spaces of a building, located within risers and taking the heat to the boundary of the property.
- Tertiary Network - The pipework within a dwelling connecting to radiators.



3.25. The OBC will investigate the options and impacts for upgrading all the pipework systems. Due to the scale of PDHU, and early stage of the project,

a representative selection of 13 building archetypes have been selected, which represent 80% of the buildings connected to PDHU.

- 3.26. A secondary and tertiary network design report will be developed for each of the 13 building archetypes covering the following:
- Options for installation of new secondary and tertiary pipework systems including architectural design.
 - Technical requirements for provision of heating control systems including heat interface units (HIU's) and energy metering systems.
 - Assessment of the options for provision of heating and hot water services, including 2 pipe and 4 pipe systems.

South Westminster Area Network (SWAN)

- 3.27. SWAN is a project being developed by the Department for Energy Security and Net Zero. SWAN is an area wide energy network supplying low carbon heat to over 350 customers (circa 1,000 buildings) from multiple energy centres, utilising a variety of heat sources.
- 3.28. There is potential for SWAN to provide heat to PDHU. Under this option PDHU would purchase heat from SWAN, with the existing energy centre taken over by the SWAN developer.
- 3.29. An OBC is currently being developed and is expected to be issued to WCC in March 2024. Once received, the SWAN option can be compared against the other shortlisted options.
- 3.30. It should be noted that the existing pipework will still require replacement under this option as outlined above. However, there may be scope for SWAN to 'adopt' the primary network.

Thermal Battery Option

- 3.31. WCC are also working with commercial parties to explore providing heat via a Mobile Heat Project. This would involve moving waste heat from an Energy from Waste facility on the River Thames to PDHU. The heat would be transported in mobile thermal batteries mounted on barges, travelling 28 km along the Thames. A summary of the option has been included in the appendices.
- 3.32. A thermal battery is like an electrical battery, but it stores heat. The thermal batteries use a non-toxic, non-flammable phase change material (PCM) based on salt, developed by Sunamp with the University of Edinburgh.
- 3.33. As well as supplying heat, Cory would manage barge logistics. Cory has the longest continued lighterage operation and largest barge fleet on the Thames, which transports residual waste to its EfW plant. Cory already operate a barge waste transfer station opposite PDHU on the south bank of the Thames.

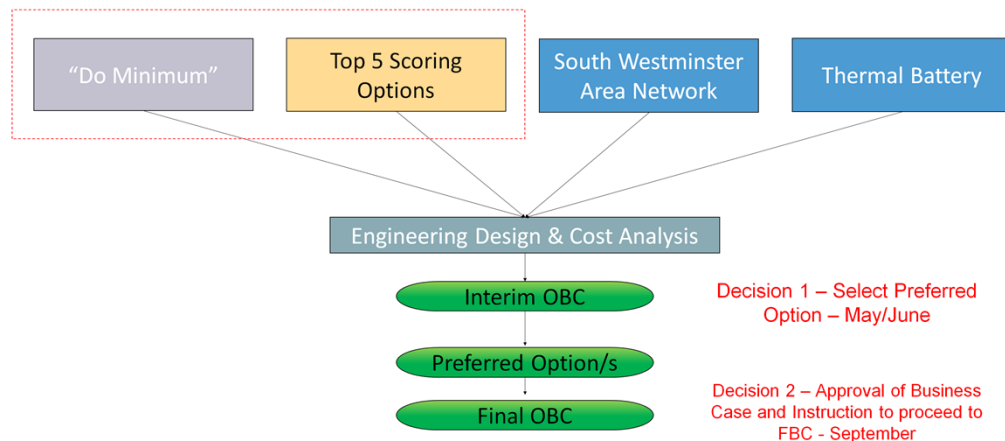
3.34. An initial proposal was submitted by the supplier in December 23 which provided early positive results. A detailed proposal has been instructed which is expected to be issued to WCC by March 24. A demonstrator battery has also been installed at the Pump House to test how the technology integrates with the network. The results of this test will be assessed as part of the next stage of analysis.

Next Steps

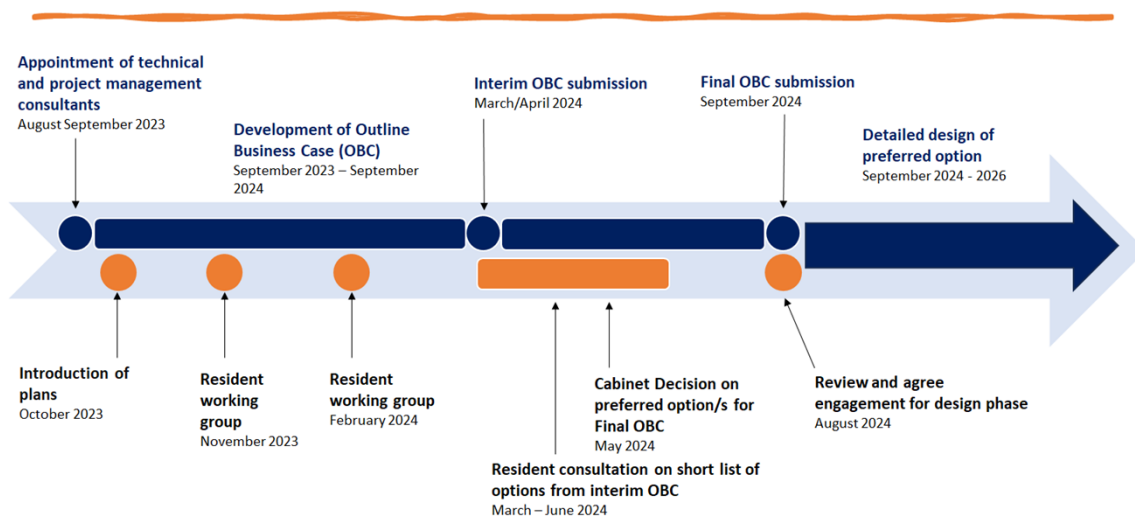
3.35. The diagram below outlines the current proposed approach to Governance and decision making on a preferred option. There are currently 8 options being considered by the project team. These options will be modelled and presented in an interim OBC to Cabinet in May 2024. A decision then be taken on which of the options will be taken forwards to full RIBA Stage 2 design and final OBC.

3.36. The final OBC is forecast to be completed in September 24, with decision on a final preferred option, followed by progression to the full business case stage. The dates shown on the timeline are subject to change and dependant on the outcomes from the governance and stakeholder engagement.

Governance and Decision Making



Timeline



Resident Engagement and Consultation

3.37. A programme of engagement and consultation is in progress, with further details provided in section 8.

4. Financial Implications

4.1. A proposed funding strategy for the PDHU project was presented to the Budget Scrutiny Task Group on Thursday 25th January 2024. Given that a preferred option has yet to be identified, the purpose of this was to identify an appropriate approach to funding the different components of the future project (regardless of the option chosen) and to ensure that adequate funds were allocated within the Council's capital strategy for elements that it might be required to fund directly.

4.2. Any future project can broadly be split into two elements:

- Investment in external network infrastructure (including the heat source and external pipework, known as the primary network)
- Internal upgrades to pipework within blocks and dwellings (known as the secondary and tertiary network)

4.3. The proposed funding strategy differentiates between the two. Any investment required for external network infrastructure will be structured as a commercial model. This means that the cost of required capital expenditure will be built into the tariff charged for energy consumption via the network. This approach is consistent with the models used across the energy sector.

- 4.4. Upgrades to internal communal pipework are considered to be a landlord responsibility and covered within obligations to maintain the condition of housing stock. It is therefore assumed that the HRA will be required to cover this investment on behalf of its tenants. This will therefore be treated in the same way as any Major Works programme within the HRA and an appropriate allowance has been allocated in the revised HRA Business Plan to ensure that the necessary funds have been earmarked in advance to allow the project to progress once a preferred option has been selected.
- 4.5. This assumption means that leaseholders will also be required to contribute to any works that upgrade the condition of their properties in the usual way. However, in order to mitigate the financial impact on network users, the Council is reviewing opportunities to cover this cost via an annual service charge spread over a much longer period of time (and also ensure that the charge follows the property rather than the leaseholder).
- 4.6. Given the potential impact of the above on residents, value for money and affordability have been identified as critical criteria within the methodology being developed for the options appraisal. The appraisal will take a holistic view of the expected cost impact for network users on annual basis, which will combine the cost of energy with any potential annual service charges.

5. Legal and Governance Implications

- 5.1. Any contracts associated with investment in the PDHU will potentially fall within the scope of the Public Contract Regulations 2015 or the Utilities Contracts Regulations 2016 (or the new Procurement Act 2023 when it comes into force). Application of the relevant procurement legislation will need to be considered as part of the OBC

6. Carbon Impact

- 6.1. The existing PDHU network accounts for nearly 40% of WCC's annual carbon emissions and this project could potentially have a significant impact on emissions from the network.
- 6.2. The modelling carried out during the SOC indicated a potential carbon reduction of between 55% and 75% by 2030.

7. Equalities Impact

- 7.1. An EQIA assessment will be undertaken following the interim OBC, once more clarity on the preferred option/s are confirmed.

8. Consultation and Engagement

- 8.1. A programme of stakeholder management, resident engagement and consultation is in progress to ensure resident views are taken onboard and fed into the business case process.
- 8.2. A resident advocate and independent consultant have been appointed to the project team who will act as the resident voice throughout the business case process.
- 8.3. A resident working group has been established, with the first meeting held in November 23 and a second meeting planned for 22nd February 2024. The role of the working group is:
 - To support WCC in reviewing options for the future of PDHU
 - To ensure resident priorities and concerns are fully considered and accounted for
 - To assist WCC in communicating clearly and effectively with residents more widely
- 8.4. The first working group was attended by 30 residents, with some valuable feedback received on the approach being taken to develop the OBC
- 8.5. There are a range of other activities planned during the OBC, this includes:
 - Launch of PDHU Common Place website (February 2024)
 - Issue of PDHU newsletter (March 2024)
 - Local events at each estate to provide further detail on the options as the design progresses. This will be held in conjunction with the project team managing the rollout of metering across PDHU (May 2024)
- 8.6. A ward Councillor briefing note will also be issued in the near future providing a summary or progress with the OBC.

If you have any queries about this Report or wish to inspect any of the Background Papers, please contact Report Author, cspicer@westminster.gov.uk

APPENDICES:

- Appendix A – Thames Mobile Heat Proposal – Summary
- Appendix B – PDHU Strategic Outline Case