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Project name:
Red & Yellow Specialist Extra Care - Melliss Avenue, Kew

Project ref:
4617

From:
Robert Murphy and Colin Page, AECOM

Date:
7th June 2019

Re: GLA Energy Strategy Review

Following the submission of planning application (London Borough of Richmond upon Thames reference 18/3310/FUL, GLA Case Number 4617) for the redevelopment by our client, Melliss Ave Devco Limited, of the former Kew Biothane Plant on Melliss Avenue in Kew, we were pleased to receive comments from the GLA's Case Officer, Kate Randall, dated 14/11/18 on the Energy Strategy, which broadly confirmed that *the Energy Hierarchy has been followed* and *the proposed strategy is generally supported*. This aligns with feedback received from LBR's appointed energy consultant (Climate Integrated Solutions) confirming that the proposed energy and sustainability strategy was in compliance with the appropriate policy. Indeed, a number of the comments raised by the GLA were the same as those identified by CIS and therefore the responses and supplementary information provided below are identical to those provided to, and subsequently accepted by, CIS.

We have listed in the table below the comments from the Case Office, alongside our response, with supplementary information provided at the end of the table where required.

Further comments have been received in an email dated 21st December 2018 (from Robbie Thompson to Kate Randell of the GLA), but only received by the client team on 1st May 2019 (emailed by Hannah Thomas of the GLA to Marlon Deam of DP9, the client's planning consultant); these new comments have been added to the table below in red text, alongside an initial response from the client's designers. Closed items are indicated in green text.

After further review by the GLA team (Robbie Thompson, via email to Hannah Thomas on 22/05/2019, subsequently forwarded on to DP9), the principle of an ambient temperature loop has been agreed as appropriate for this scheme, subject to provision of further information. This pragmatic approach is welcomed by the applicant, and the requested information has been provided in the table below. As before, the most recent GLA comments and client team responses have been added to the table, this time in blue text. As before, closed items are indicated in green.

GLA Comment	AECOM Response November 2018	GLA Comments 1st May 2019	Client Team Response May 2019	GLA Comments 22nd May 2019	Client Team Response June 2019
1. The Energy Hierarchy has been followed; the proposed strategy is generally supported; however, the applicant should submit additional information to ensure compliance with the London Plan policies.	Agreed	-	Closed	-	Closed
2. The applicant is encouraged to use the GLA's Carbon Emission Reporting spreadsheet, which has been developed to allow the use of the updated SAP 10 emission factors alongside the SAP 2012 emission factors. The link to the spreadsheet can be found here: https://www.london.gov.uk/what-we-do/planning/planning-applications-and-decisions/pre-planning-application-meeting-service-0. This is encouraged to be submitted for review.	The impact of the changing carbon factors was considered in the submitted Energy Strategy (section 7), for precisely the reasons identified here, which shows a significant improvement in the carbon performance. We have downloaded the GLA spreadsheet and attempted to enter the necessary figures into it. However, there appear to be a number of errors and the spreadsheet is (deliberately) locked to prevent us from amending it. As an example, the all-electric non-domestic building's carbon is only dropping from 17kg/m^2 to 15kg/m^2. We understand that an updated version of the spreadsheet may be being prepared and therefore we propose waiting for this. The qualitative impact of the	No further action until spreadsheet has been updated.	Agreed.	-	-

	revised carbon factors is already considered in the project Energy Strategy, showing the further benefits of the proposed energy strategy if these were deemed to apply to this project.				
BE LEAN 3. A range of passive design features and demand reduction measures are proposed to reduce the carbon emissions of the proposed development.	Agreed	-	Closed	-	Closed
CO2 and Energy Performance Domestic 4. The domestic element development is estimated to achieve a reduction of 2.3 tonnes per annum (2.1%) in regulated CO2 emissions compared to a 2013 Building Regulations compliant development. The applicant should note that the new draft London Plan includes a target of a 10% improvement on 2013 Building Regulations from energy efficiency which applicants should be aiming towards. The applicant should therefore model additional energy efficiency measures and commit to higher carbon savings through energy efficiency alone.	This query is a new one (i.e. not previously requested by LBR in their comments). We understand that it forms part of the emerging GLA policy but may not be specifically applicable to this project by virtue of the date when it was submitted. The building performance has been optimised as far as practicable, especially considering the specific requirements of the occupants (e.g. large glazed areas to promote natural daylight, wellbeing and recovery). For example, we did model the impact of higher performance glazing (lower g values), which did reduce the	Be Lean has been at the top of the GLA energy hierarchy for several years and therefore to be prioritised. The savings the applicant has achieved suggests that this part of the hierarchy has not been prioritised. The applicant is required to model further energy efficiency measures. **Item is still outstanding.**	We would dispute this, as significant efforts were made to meet and improve upon the compliant building using "be lean" measures alone. At this stage, delivering further improvements through the building form and fabric would likely have a significant impact on the massing and architectural look of the building, which is not something the client would wish to pursue. We would also add that further reductions in the U-values would lead to increases in the cooling loads and risk of overheating, which we would wish to avoid for obvious reasons.	The applicant disputes that additional improvement are required in Be Lean and they would lead to impact on massing and architectural look and increases in cooling load, however, no quantitative assessment appears to have been undertaken showing the impact of these issues as such the requirement still stands and further improvement to fabric energy efficiency is required.	To substantiate the previous statement, further modelling has been undertaken. If the g-value is altered from the current figure of 0.45 (a high-performing solar control glass) to a value of 0.72 (glass without a coating), the improvement from "be Lean" would increase from 2.1% to 8.3%, however the apartments would suffer from unacceptable overheating. This is undesirable for a number of obvious reasons, especially considering the elderly nature of residents. Overheating is a particular concern for older residents. Older people are at an increased risk of heat related illness, especially if their health is already deteriorating. They are usually less able to adapt to higher temperatures. In addition older people will often be at home for most of the day and therefore exposed to peak day temperatures within their housing development.

	heating load but had a corresponding negative impact on overheating and cooling requirements; the current proposal is, in our view, a sensible compromise – especially considering an overall 35% improvement is achieved taking all measures into account.				As there is no aspiration to introduce cooling to the apartments (with the corresponding increase in overall carbon dioxide emissions), we believe the current proposal – using a solar control glass to achieve a sensible balance between beneficial heating whilst avoiding overheating – which may not achieve the consultation GLA proposed 10% improvement for the Be Lean Case, but does achieve the overall 35% improvement – is a proportionate approach.
5. The applicant has provided the 'be lean' DER and TER output sheets from the modelling software; however these are not labelled. The applicant should provide and clearly label DER and TER output sheets for each stage of the energy hierarchy. The applicant should provide a summary table showing all apartments TER and DERs and how the overall development carbon emissions have been calculated.	This is similar to a query raised by CIS for LBR and therefore we can respond quickly (we previously provided additional tables with results in our response to LBR, which is also attached for information to this response to the GLA comments) The split between residential and non-residential units is included as figure 6.1 in the energy strategy report (also included in the supporting information below this table), which shows the baseline, be lean, be clean and be green figures. Individual values have been provided for each of the sample dwellings – see	Documents provided. No further action required.	Closed	-	Closed

	supporting information below this table. The TER worksheets for each sample apartment at each stage (baseline, be lean, be clean) have also been provided separately.				
Non-domestic 6. The non-domestic element of the proposed development is estimated to achieve a reduction of 5.3 tonnes per annum (5.7%) in regulated CO2 emissions compared to a 2013 Building Regulations compliant development. The applicant should note that the new draft London Plan includes a target of a 15% improvement on 2013 Building Regulations from energy efficiency which applicants should aim towards. The applicant should therefore model additional energy efficiency measures and commit to higher carbon savings through energy efficiency alone.	This query is a new one (i.e. not previously requested by LBR in their comments). We understand that it forms part of the emerging GLA policy but may not be specifically applicable to this project by virtue of the date when it was submitted. The building performance has been optimised as far as practicable, especially considering the specific requirements of the occupants (e.g. large glazed areas to promote natural daylight, wellbeing and recovery). For example, we did model the impact of higher performance glazing (lower g values), which did reduce the heating load but had a corresponding negative impact on overheating and cooling requirements; the current proposal is, in our view, a sensible compromise	See response to item 4 above. Item still outstanding	Similar to item 4 above – we do not believe that achieving a 15% reduction through energy efficiency for the non-domestic elements is possible without fundamentally affecting the look and feel of the building. In addition, it may lead to unintended consequences, including additional cooling requirements or overheating. We would reiterate the earlier point that the *requirement* to achieve the additional improvement (beyond Building Regulations compliance) through energy efficiency was not in place at the time of preparing and submitting the application.	See response to item 4 above. Further consideration of energy efficiency measures is required. Item is still outstanding	Similarly to the domestic areas (point 4 above), we do not believe there is merit in worsening the performance of the glazing in the non-domestic elements of the project (ground floor) to increase the % improvements from energy efficiency measures alone towards the 15% targeted in the draft London Plan that wasn't applicable at the time of design. The overall impact on the project of this – in terms of total carbon emissions, extent of overheating, resident health and wellbeing etc – would be counter-productive. However, for the ground floor areas we have also explored other alternatives to achieving further improvements. Through a combination of introducing a shading canopy to the restaurant (shown in the supporting evidence below this table), reducing the specific fan power of the AHUs serving ground floor to 1.4W/l/s and specifying higher performance pumps with variable speed control, we can achieve an 8.5% reduction from energy efficiency alone, up from 5.6%. We trust that this commitment will be

	– especially considering an overall 35% improvement is achieved taking all measures into account.				welcomed, especially given that the 15% target is not fully applicable to this project.
7. The applicant has provided the 'be lean' BRUKL sheets from the modelling software. The applicant should confirm that the boiler efficiency used in the 'Be Lean' assessment is the same as the boiler efficiency for the notional building.	Confirmed – an SCOP figure of 91% has been assumed, which is in line with the guidance – see supporting information below this table for further information,	This doesn't fit with the supplied BRUKL sheet that suggests that 0.96 was used.	The figure shown on the BRUKL sheet is the "nominal" efficiency of the boiler. This is not otherwise used in the calculation and we can easily change it to match the 91% seasonal efficiency that is actually used in the calculations.	Applicant confirmed that 91% has been used. No further information is required.	Closed
Energy Demand and Fabric Energy Efficiency 8. In line with the latest GLA guidance the applicant should report the overall Part L Fabric Energy Efficiency (FEE) performance of the development for both the baseline and the 'be lean' stages of the energy hierarchy in MWh/year and kWh/m2. The percentage of improvement (%) should also be provided.	This additional information is provided in the supporting evidence below this table, noting again that the energy strategy was prepared in accordance with an earlier version of the GLA guidance.	Details supplied no more information required.	Closed	-	Closed
Cooling and Overheating 9. The demand for cooling and the overheating risk will be minimised through improved g-values, extract ventilation and solar shading.	Agreed	-	Closed	-	Closed
Domestic 10. A Dynamic Overheating Analysis has been undertaken to assess the overheating risk within the dwellings using the CIBSE TM59 methodology and the London Design Summer Year 1 (DSY1) weather file: 2020s, High emission, 50% percentile scenario, this is welcomed.	Agreed	-	Closed	-	Closed

11. The results show that the design proposals are anticipated to meet the CIBSE recommendations for comfort, assuming natural ventilation i.e. occupants can open the windows.	Agreed	-	Closed	-	Closed
12. The applicant is required to assess a sample of corridors to ensure no overheating occurs.	This is similar to a query raised by CIS for LBR – we responded to CIS that: Overheating assessment is normally only required in communal corridors where communal heating systems run through them; given the proposed operating temperatures of the ASHP system (at ambient temperatures of 15-20ºC), this is not considered applicable here and therefore overheating of corridors has not been assessed.	Modelling should be undertaken once flow and return temperatures have be finalised Item still outstanding.	This modelling could be undertaken, but there was no reason to do it previously as there is no hot pipework running in the corridors that would contribute to overheating. This is one of the benefits of the proposed low temperature ambient heat loop. We suggest the need for modelling is determined once the principles of a low temperature ambient loop are accepted (or otherwise).	See response 19, no further information is required.	Closed
Non-domestic 13. The area weighted average (MJ/m2) and total (MJ/year) cooling demand for the actual and notional building has been provided but the actual building's cooling demand is higher than the notional. The applicant is required to model further passive measures to ensure the building's actual cooling demand is below the notional.	This is similar to a query raised by CIS for LBR – we responded to CIS that: As can be seen from the IES diagram included in the supplementary information below this table, the majority of non-residential areas at ground floor level are cooled – due to the required function of the space and the sensitivity and specific requirements of the residents.	The GLA Cooling Hierarchy requires that passive measures are used first to reduce mechanical cooling, if it is required. 25% is a significant increase above the notional. Further passive measures should be investigated. Item still outstanding.	To be discussed further. Whilst we recognise the reasons behind pushing for lower cooling loads, this is particularly difficult for this type of building. The approach taken in the energy strategy followed the principles set out in the guidance applicable at the time of submission, mainly that "*If meeting the notional cooling demand is not possible, the applicant should provide a clear explanation of why it is not*	Applicant suggests that it is not practical to reduce cooling energy demand to below the notional. While it is accepted that reducing cooling demand can be difficult in certain circumstances, the applicant has not adequately described why further reduction is not possible and has not demonstrated that it has reduced the actual cooling requirement as far as	Our residents will be elderly such that eligibility restrictions agreed through the S106 agreement will determine that the purchaser will be over 65 and have an existing long term health condition. It is expected that the majority of residents will be in the age range of 75-90. The specialist nature of the extra care development has taken into account the impact and importance of both natural daylight and heat on residents' health, wellbeing and therapeutic activities.

	Those spaces without cooling are either unoccupied rooms such as plantrooms, risers or stores, or circulation spaces. The actual cooling demand for this building is higher than the notional because of the specialist (care) requirements of the occupants of the building. In addition to providing cooling in areas which may not otherwise need it (to provide respite areas during high ambient conditions), the building necessarily features areas with high glazing areas, which are provided at ground floor level to promote well-being, recovery and quality of life for the residents of this specialist extra care development. The cooling demand is higher in the actual building than the notional building by 25% (as set out in table 4.4 of the energy strategy). Through the use of efficient equipment this reduces to 15% due to the efficient cooling equipment used. Cooling accounts for only 14% of the regulated CO_2 emitted from the non-		*possible and outline the implications for building design";* the guidance introduced post-submission has changed to promote further energy savings, resulting in this request. We do not believe that it is practicable to reduce the cooling energy demand for this special type of building to below the notional building.	possible. As such item is still outstanding.	The ground floor needs to optimise natural light in areas predominantly used by residents, however compromises have been made architecturally and technically to help balance the energy efficiency. In addition to the need for natural light, heat is also a major issue for the elderly, particularly in summer months whereby they are most vulnerable, find it difficult to respond to the extremes and this can lead to heat related illness. Getting the right balance between active and passive ventilation and cooling has been a challenge; in both circumstances a focus on the resident has been a fundamental consideration. As part of the design canopies and shading have been included on the latest layouts to the café/restaurant terrace which is south facing. Further to item 6 above, the introduction of the canopy to the restaurant does help somewhat, though again the modelling software does not accurately reflect this – refer to the IES results in the supporting information below this table, which seem to show only a 0.1% benefit from the canopy. In discussion with IES, we have identified a work-around to enable the true benefit to be included – as per the results at the end of this table, the

	domestic areas (prior to the reduction associated with PV).				difference becomes 22% rather than 25%. We have undertaken further interrogation of the IES modelling to understand what is driving the numbers. In part, this is down to a technicality / quirk of the modelling software and calculation methodology; In uncooled rooms, the notional gets 5 ACH of outside air, for free, but the actual building does not. This usually doesn't matter much, as these rooms aren't cooled so the extra cooling doesn't make much difference. In our building however there are little pockets of cooled rooms surrounded by uncooled rooms which get quite hot (within the model), so the extra heat is leaking from the uncooled rooms into the cooled rooms and causing extra cooling. If one changes the entire commercial areas to mechanically cooled, the total cooling demand increases … but the notional increases more. So, we could actually achieve a 9% reduction in the actual cooling demand compared to the notional cooling demand if we specified cooling to all areas of the ground floor. But, given that this would result in overall higher emissions, we do not believe this is sensible / responsible. We are therefore faced with a choice between 2 options:

					1) having a +22% difference between actual cooling demand and notional cooling demand, but lower overall emissions, or; 2) having a -9% difference between actual cooling demand and notional cooling demand, but higher overall emissions We would be happy to discuss this further with the officer if beneficial, as clearly none of the parties involved want a supposedly green initiative / requirement to lead to additional CO_2 emissions, but we recognise there may be a desire to comply with applicable policies.
BE CLEAN **District heating** 14. The applicant has carried out an investigation and there is no existing or planned district heating networks within the vicinity of the proposed development.	Agreed	-	Closed	-	Closed
15. The applicant has provided a commitment to ensure that the development is designed to allow future connection to a district heating network. Drawings demonstrating how the site is to be future-proofed for a connection to a district heating network should be provided; these should include space provision for heat exchangers in the plant room, isolation valves, safe-guarded pipe route to the site boundary etc.	This is similar to a query raised by CIS for LBR – we responded to CIS that: Plant layout drawings have not been produced yet, as the design has not progressed to this stage. To allow for connection to any future very low carbon district heat network, we are proposing to leave space in	Production of indicative drawings is required and should be prioritised. **Item is still outstanding.**	As per the previous response, the design has not progressed to this level of detail. Appropriate conditions could be proposed to ensure that this future connection is provided.	Applicant suggests that drawings have yet to be produced. While it is accepted that full finalised drawing may be not possible, indicative drawings should still be provided to demonstrate that the issue has properly been considered. Item is still outstanding	With the principle of an ambient temperature loop having been agreed, we have produced a set of indicative block plant layouts – included in the supporting evidence below this table – demonstrating, amongst other things, how any future district heat network could be extended to the ground floor heating plantroom. We would, however, note – and agree with – the officer's recent comments that the likelihood of a suitable DH

	the ground floor heating plantroom for future plate heat exchangers to be installed, which could replace the building's primary heating plant. Suitable valved-off connections would also be provided into the main flow and return pipework to allow the secondary LTHW from the PHX to connect into the building's heating distribution. Due to the operating characteristics of the proposed heating system (the air source heat pump will be selected to deliver the primary water loop between 15 to 25), there may be technical issues with connecting in a district heating system, which could potentially require the apartment heat pumps to be replaced with appropriate heat interface units; the feasibility of this would be assessed at the time at which any potential DH system is available. We would further note that the viability of making such a connection will depend not just on the availability,				network being available, that would lend itself to the operating characteristics of the R&Y building – is very low and therefore would not propose that any physical infrastructure / provisions are made on the site for this connection; we have simply indicated how such pipework may be brought to the primary heating plantroom. We do not anticipate any scenario under which it would be advantageous – considering capital cost, operating cost, resident running cost, energy consumption and carbon dioxide emissions – to replace the central plant and the individual residential heat pumps with a system that worked on the likely operating temperatures of a district heating network. Any such change would only be considered as part of a full end-of-life plant replacement strategy – it is therefore only considered appropriate that we think about a possible pipework route at this stage (and build in valved connections to the primary pipework headers), rather than actually providing any additional plant or pipework.

	reliability, carbon intensity and operating temperatures of the future district heating network, but also on the economic and legal aspects of such a connection, which would need to be considered by the building operator.				
16. The applicant is proposing to install a site-wide ambient temperature heat network. However, the applicant should confirm that all apartments and non-domestic building uses will be connected to the communal heat network.	Agreed - this is the current strategy. All users will be connected to the communal heat network.	-	Closed	-	Closed
17. The applicant should confirm the modelled flow and return temperatures used for the site-wide network.	A notional flow temperature of 15-20 deg has been "modelled" (although we would note that the modelling software does not actually use the flow temperature in the calculations, just the COP efficiency).	Flow and return temperatures will make a huge difference on pumping losses, pipe losses, pipe sizing, overheating and heat pump efficiency. As such it is vital that they are properly understood. The applicant is required to demonstrate each of these issues have been taken into account and detail the methodology used to come up with the flow and return temperatures. Item is still outstanding	The comment is intrinsically linked to the system used – as covered in items 19 and 22 below, if an ambient temperature heating loop with local top up (as currently proposed and modelled) is not acceptable, then there are fundamental changes required to the entire scheme.	See response to 19. Item is still outstanding	Refer to item 19 below.
18. Further information on the floor area, internal layout and location of the energy centre/rooftop plant space should be provided.	Plant layout drawings have not been produced yet, as the design has not progressed to this stage.	Production of indicative drawings is required and should be prioritised. Applicant should know the location and area allocated	The plantroom area is defined on the roof drawing, which has been based on advice from the engineers to the architects on the likely space requirements. Further	-	Refer to item 15 above, as well as the indicative block plant layouts included as supplementary information below this table.

	Sufficient space has been allowed within the plantrooms at ground and roof level for the anticipated plant based on benchmarks and similar projects. Alongside other MEP plant, final details of the air source heat pumps proposed for the building have not yet been specified and as such only generic information on the performance of the equipment has been identified and used within the energy modelling. However, the team is confident that the allocated areas will be sufficient – detailed design drawings will be produced at the next design stage.	for the plant room. Item is still outstanding.	detail is not available until the next stage of design has been completed.		
19. The applicant is proposing to use in-dwelling water source heat pumps to provide adequate temperature to the dwellings. Having multiple small heat pumps does not adhere to GLA energy guidance and therefore the applicant is required to review its approach to heat provision and present a strategy where all heat is provided from a single energy centre.	We believe that the proposed approach is more efficient than a single energy centre supplying heat at the "final" temperature to all apartments. The proposed strategy is to use a centralised air source heat pump system. Temperatures are raised centrally, then distributed to each flat where the temperatures are "topped	The GLA's energy guidance was developed fully aware of each of the points that the applicant raises. While the applicant may believe that it's system is more efficient in theory and practice it not does adhere to GLA's energy guidance. Consideration of a centralised approach is required. Item is still outstanding.	Whilst respecting the officer's opinion, we believe that the ambient temperature loop (supplied by centralised air source heat pumps) topped up by efficient heat pumps in each apartment is appropriate for this building – and delivers significant energy and carbon savings compared to a system where heat is generated centrally from an energy centre and distributed throughout the building at higher temperatures.	Further consideration has been undertaken and given the specific nature of the site it is considered that an ambient temperature system could be acceptable if the applicant is able to demonstrate the following: - The system provides carbon savings beyond a traditional high temperature heat pump system in these circumstances	We appreciate the officer's consideration of the specific nature of this scheme and welcome his acceptance of an ambient temperature system. Further details are included in the supplementary information below this table to address the queries, which we would be happy to discuss at a follow-up meeting should it be beneficial. Information on the approach to any proposed future connection is covered by point 15 above.

	up" to a suitable temperature for final use. While this system is still a central system, it also avoids many of the intrinsic problems which policy has driven designers to adapt, and which have been coming to the surface over the past few years as these schemes are built out. Due to a gap in the regulations, it is possible to assume only 5% of the heat generated by the central system is lost in risers and corridors on the way to the final use in the flat. Measurements on completed schemes and even basic calculations on proposed schemes shows this is not a possible target to meet using distribution along corridors. Even with better than "best practice" insulation theoretical losses of around 40% are common, with some built schemes far exceeding this. Sadly this fell between the regulations, and so under SAP 2012 one could meet policy and regulations while designing an inefficient building. This has been addressed in SAP		We believe that the GLA has accepted such systems on other projects. Equally, the testing of the equipment in use is demonstrating that the theoretical savings match the predictions. Changing the heating generation and distribution strategy at this stage of the project would have significant implications for the scheme. We would welcome the opportunity to discuss further, including reviewing other examples where this strategy has been proposed.	- All requirements in Comment 22 and Comment 17 have been addressed. - Further detail is provided to how the system would connect to a district heat network including whether WSHPs would be replaced with HIUs and impact on cost efficiency. All information should be provided at this stage and not as a condition.	

	10, where more realistic delivery losses are used. This design seeks to avoid this design intrinsic problem by distributing at lower temperatures, minimizing heat loss. Were the scheme to be assessed under SAP 10 this would be more apparent. The designers have proposed a system which is both efficient in theory and which also has potential to be efficient in practice.				
BE GREEN 20. The applicant has investigated the feasibility of a range of renewable energy technologies and is proposing to install Photovoltaic (PV) panels and Heat Pumps (etc.).	Agreed	-	Closed	-	Closed
21. A reduction in regulated CO2 emissions of 63.1 tonnes per annum 31.3% will be achieved through this third element of the energy hierarchy.	Agreed	-	Closed	-	Closed
Heat pumps 22. Centralised heat pumps are being proposed in the form of a single centralised system, ambient temperature loop and dwelling heat pump top-up. Further information on the heat pumps should be provided including: a. An estimate of the heating and/or cooling energy (MWh/annum) the heat pumps	This is similar to a query raised by CIS for LBR, but asks for significantly more information – some of which is not available until plant has been selected at a later design and procurement stage. We responded to CIS that:	While the GLA understands that detailed designed have not been finalised, the applicant must be able to demonstrate that its chosen system will work as stated. The applicant still needs to respond to these comments. Where detailed information is not	Refer to Item 19 above – we first need to agree whether the proposed system is acceptable or not, before providing this detailed information at the next stage (post planning) and would welcome appropriate conditions requiring such information to be provided and minimum standards to be exceeded.	See response to 19. Item is still outstanding	Refer also to responses to item 19 above. In addition, we can confirm that: a) The air source heat pump system will provide 100% of the heating and cooling to the development – noting that the annual MWh figures from the Part L Analysis will

would provide to the development and the percentage of contribution to the site's heat loads. b. Details of how the Seasonal Coefficient of Performance (SCOP) and Seasonal Energy Efficiency ratio (SEER) has been calculated for the energy modelling. This should be based on a dynamic calculation of the system boundaries over the course of a year i.e. incorporating variations in source temperatures and the design sink temperatures (for space heat and hot water). c. Manufacturer datasheets showing performance under test conditions for the specific source and sink temperatures of the proposed development and assumptions for hours spent under changing source temperatures. Whether any additional technology is required for hot water top up and how this has been incorporated into the energy modelling assumptions. d. An estimate of the expected heating costs to occupants, demonstrating that the costs have been minimised through energy efficient design. e. The expected heat source temperature and the heat distribution system temperature with an explanation of how the difference will be minimised to ensure the system runs efficiently. f. A commitment to monitor the performance of the	Alongside other MEP plant, final details of the air source heat pumps proposed for the building have not yet been specified and as such only generic information on the performance of the equipment has been identified and used within the energy modelling. Primary heating will be provided via air source heat pumps serving an ambient temperature water loop at between 15 and 25ºC. The air source heat pumps will be located within an external roof plant compound, with pumps and central store in the ground floor heating plant room. The system will provide a centralised energy loop to each apartment. In each apartment, a water-water heat pump will produce heating or hot water as it extracts energy from the central energy loop. The apartment water heat pump will provide space heating and hot water demand, via underfloor heating and an integrated hot water cylinder. ASHP plant selections will only be made once the contractor has been	withstanding assumptions backed up by calculation and manufacturer datasheets should be provided. Item still outstanding			be different to the actual annual energy consumption, for well-known reasons (specially the base assumptions behind Part L and the way in which unregulated loads are assumed) b) Further details of how the performance has been modelled are included in the supplementary information for item 22 below this table. Note that this is based on one possible manufacturer for the equipment; no procurement decisions have been made yet, but the modelling methodology would be similar for other equivalent products. We confirm that this methodology has been followed. c) As with b above, we have based the performance on one manufacturer – and details are included in the supplementary information below this table – but no firm decisions have been made on the actual product to be installed. An "equal or approved" approach, based on an engineering performance specification, will be taken right through

heat pump system post-construction to ensure it is achieving the expected performance approved during planning. (It is recommended that boroughs condition this).	appointed, but will be based on meeting the performance efficiency (peak load and seasonal), operating temperatures and acoustic criteria developed by the design team at the next stage. We would be happy to discuss further technical details of the modelling at a follow-up meeting with the GLA, should this be of benefit to getting agreement to the proposed energy strategy. With specific regard to each point, we would comment that: a. this information is not currently available b. some guidance has been received from the heat pump system manufacturer (c. not currently available as the final system is not confirmed. d. Accurate heating energy annual consumption figures and associated energy costs are nto available. We would				until final procurement by the appointed contractor. d) As noted earlier, Part L annual energy consumption figures are – by virtue of the fact they are used for comparison purposes between a proposed building and a notional building – bear little resemblance to the actual energy consumption of buildings in use. It is therefore not appropriate to use Part L figures – such as those which have been obtained from the modelling undertaken as part of the energy statement for planning – to predict annual running costs. In addition, no decisions can yet be taken on the heating costs charged to future residents, as there are a number of unknown factors, including the future cost of electricity as well and the extent to which the service and other charges payable by the residents (who, under the S106 and purchasing requirements, will all be signed up to some form of care package) cover things such as central plant maintenance, communal area energy consumption and incoming utility supplies. We can, however, confirm

	note that energy costs based on SAP / IES Part L modelling are not an accurate reflection of the actual energy use, due to the assumptions used for comparison purposes with the notional building. However, the applicant is committed to keeping energy costs low and the energy strategy has been proposed with this in mind, so the proposed systems have been selected to be more efficient (and cost effective over its lifetime) than an equivalent "traditional" gas boiler system. e. As described elsewhere in this report, an efficient ambient temperature of 15-20 is proposed for the primary circulating loop, to minimise heat losses, promote				that the direct energy costs payable per kwH to heat the apartments will be no greater than if the apartments were heated by a gas boiler or "traditional" equivalent. e) Agreed / confirmed f) agreed

	plant efficiency and provide flexibility in both heating and cooling modes. f. This would be welcomed.				
PVs 23. 90 kWp of PV is being proposed equating to circa 974 m2 of net PV area. A detailed roof layout has been provided demonstrating that the roof's potential for a PV installation has been maximised.	Agreed	-	Closed	-	Closed
DOMESTIC CARBON SAVINGS 24. An on-site reduction of 38.1 tonnes of CO2 per year in regulated emissions compared to a 2013 Building Regulations compliant development is expected for the domestic buildings, equivalent to an overall saving of 35%.	Agreed	-	Closed	-	Closed
25. The carbon dioxide savings meet the on-site target set within Policy 5.2 of the London Plan.	Agreed	-	Closed	-	Closed
NON-DOMESTIC CARBON SAVINGS 26. An on-site reduction of 32.6 tonnes of CO2 per year in regulated emissions compared to a 2013 Building Regulations compliant development is expected for the non-domestic buildings, equivalent to an overall saving of 35%.	Agreed	-	Closed	-	Closed
27. The carbon dioxide savings meet the target set within Policy 5.2 of the London Plan.	Agreed	-	Closed	-	Closed
28. All comments above should be addressed before compliance	Agreed	-	Closed	-	Closed

with London Plan energy policy can be verified.					

Supporting Information

For item 5:

Figure 6.1 from the Energy Strategy

Table 6-1: Estimated Baseline, Be Lean, Be Clean and Be Green Regulated CO_2 Emissions

	Baseline (Tonnes CO_2 p.a.)	'Be Lean' (Tonnes CO_2 p.a.)	'Be Clean' (Tonnes CO_2 p.a.)	'Be Green' (Tonnes CO_2 p.a.)	Improvement over Baseline from 'Be Green' (%)
Domestic	108.9	106.6	106.6	70.8	35%
Non-domestic	93.2	87.9	87.9	60.6	35%
Site-wide Proposed Development	**202.1**	**194.6**	**194.6**	**131.4**	**35%**

Domestic

				Base Line		Be Lean		Be Green	
URN	TFA (m2)	Sample Count	Average Sample Area (m2)	DER	Total CO2 in Tonnes represented by flat	DER	Total CO2 in Tonnes represented by flat	DER	Total CO2 in Tonnes represented by flat
02p02	104.6	12	89.8	14.1	15.2	13.2	14.3	9.2	9.9
02p05	97.2	7	92.2	14.2	9.2	13.6	8.8	9.4	6.0
02p09	88.3	16	84.6	13.8	18.7	13.2	17.8	8.8	11.9
02p12	94.5	17	92.7	13.2	20.8	12.8	20.2	8.6	13.5
02p15	82.8	9	84.2	13.6	10.3	14.1	10.7	9.4	7.1

02p19	53.1	20	69.0	15.7	21.6	14.8	20.4	8.9	12.2
04p01	98.8	2	75.7	15.9	2.4	16.4	2.5	11.3	1.7
04p10	123.5	1	129.6	13.9	1.8	14.2	1.8	10.0	1.3
05p03	103.2	3	107.5	16.9	5.5	19.0	6.1	13.3	4.3
05p08	121.2	2	121.8	14.1	3.4	16.5	4.0	11.6	2.8
					108.9		106.6		70.8
							2.1%		35%

Non-Domestic

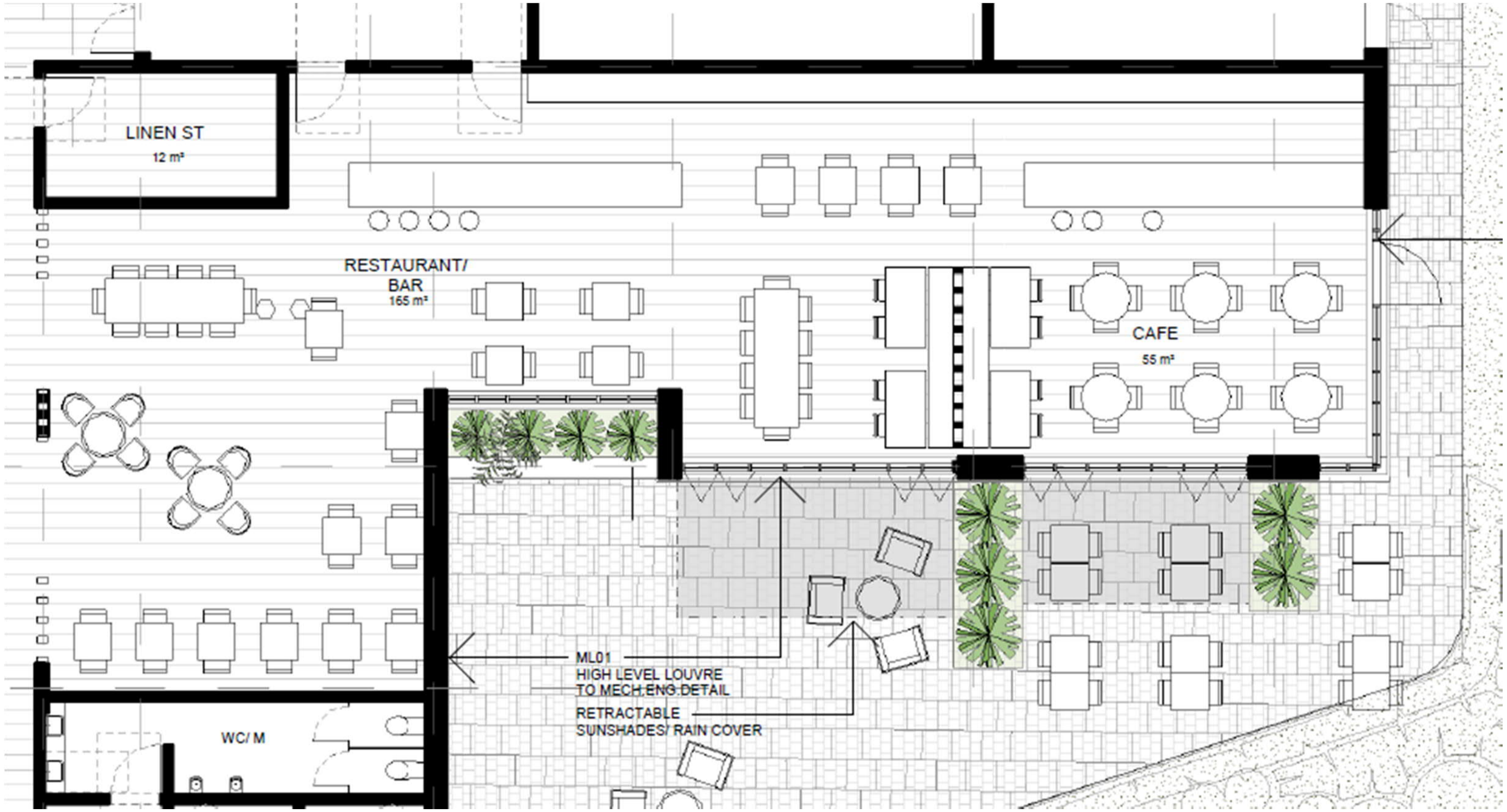
	Base Line		Be Lean		Be Green	
TFA (m2)	BER	Total CO2 Tonnes	BER	Total CO2 Tonnes	BER	Total CO2 Tonnes
3421.8	27.2	93.2	25.7	87.9	17.7	60.6
		93.2		**87.9**		**60.6**
				5.7%		35%

Total

	202.1	**194.6**	**131.4**
		3.7%	35%

For Item 6 and 13:

Extract from latest ground floor architect's drawing PA2.10 showing sunshades to restaurant terrace.


LINEN ST
12 m²
RESTAURANT/
BAR
165 m²
CAFE
55 m²
ML01
HIGH LEVEL LOUVRE
TO MECH;ENG DETAIL
RETRACTABLE
SUNSHADES/ RAIN COVER
WC/ M

For item 7:

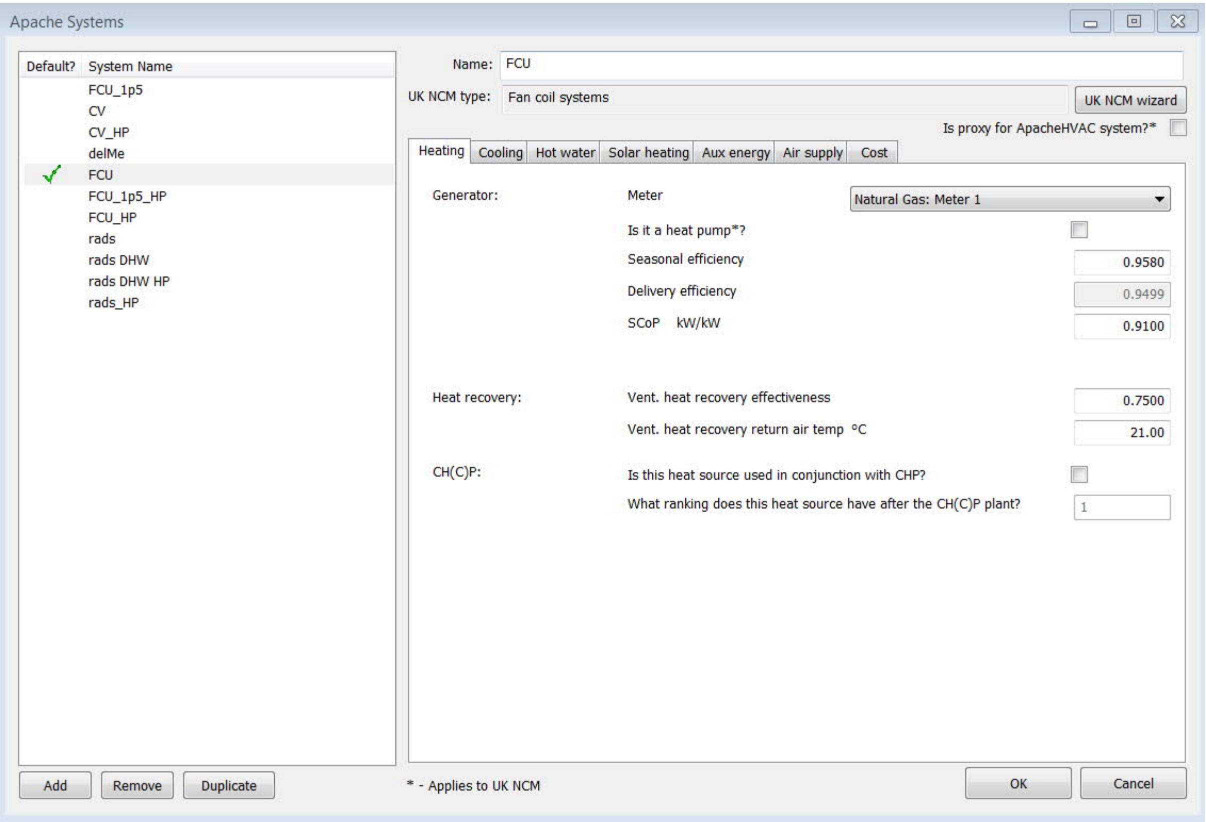
10.5 So the improvements from energy efficiency alone can be understood, the appendix of the energy assessment must include a summary output sheet from the modelling work (i.e. a print out such as a full BRUKL report) only taking into account energy efficiency measures, **i.e. excluding CHP and renewable energy**. The 'be lean' case should assume that the heating is provided by gas boilers and that any active cooling would be provided by electrically powered equipment. The boilers should be assumed to have an efficiency of 89.5% for residential and 91% for non-residential and controls aligned with the Part L notional building assumptions. Higher efficiencies should only be used if gas boilers will be part of the final strategy (i.e. after the 'be clean' and 'be green' tiers of the hierarchy have also been addressed), in which case the gross efficiency of the gas boiler model to be specified can be used. If a communal heating system is being proposed, this should be included within the modelling for the 'be lean' case (i.e. the energy supply for a large apartment block would be provided by communal gas boilers not individual ones in each dwelling).

The London plan requirement for the "be lean" case (where in reality no boiler is to be used) is to use a value of 91%, not the value in the notional building, which could be much lower than this.

Table 7 Heating system SCoP and emission factors for side-lit (whether HVAC specification is heating only or heating and cooling) and unlit activities in the Notional building

Heating fuel used in the Actual building	Space heating	Hot water	Heating fuel emission factor in the Notional building ($kgCO_2/kWh$)
Bio-fuels (i.e., whose emission factor < emission factor of natural gas)	63.0%	66.5%	The factor for the particular bio-fuel
Natural gas	81.9%	86.45%	0.216
LPG			0.241
Dual fuel (Mineral + Wood)			0.226
Fuel oil			0.319
Electric heat pump	243.0%	256.5%	0.519
Non-electric heat pump	126.0%	133.0%	The factor for the particular fuel
Electricity (direct)	81.9%	86.45%	0.319
Other fuels (i.e., whose emission factor > emission factor of fuel oil)			

It is not clear if this should be the seasonal, or system efficiency. As this does not impact the final target this is possibly of little importance. In this case, the SCOP has been input at 91%, with the Seasonal Efficiency a higher value of 96%. The SCOP is the value used in the calculations, with the Seasonal Efficiency reported on the BRUKL sheet.



Item 8:

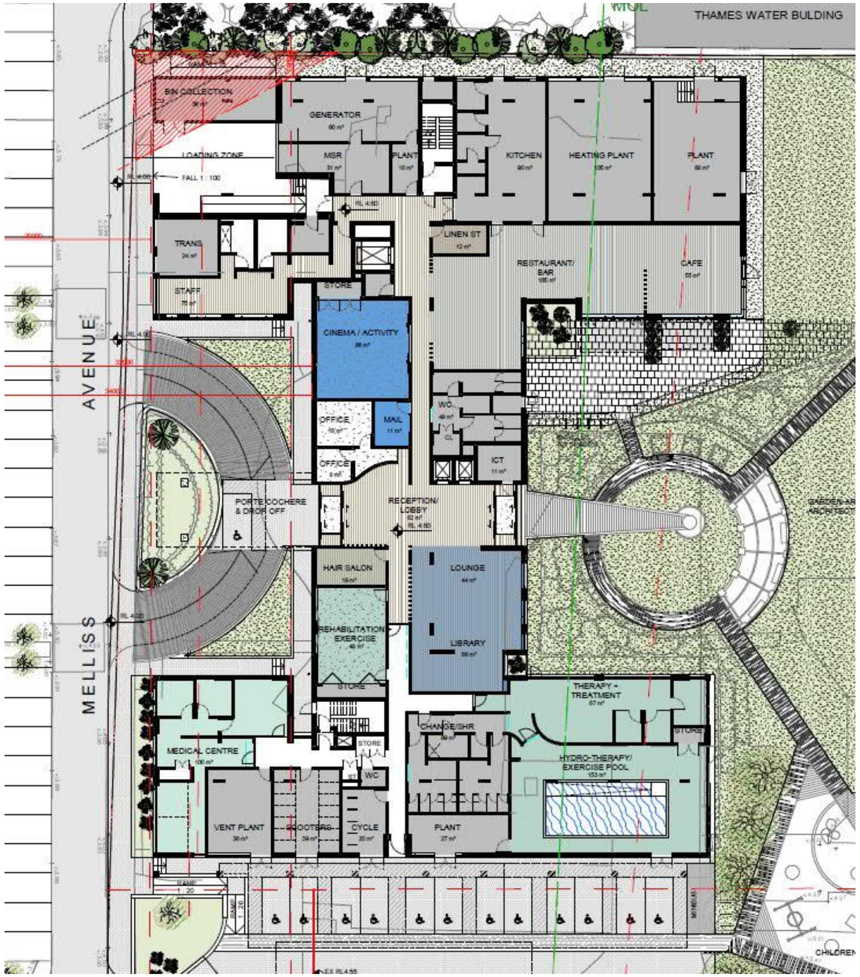
Domestic

				Base Line		Be Lean		
URN	TFA (m2)	Sample Count	Average Sample Area (m2)	TFEE	Total Fabric Energy Efficiency (MWh/year)	DFEE	Total Fabric Energy Efficiency (MWh/year)	% improvement
02p02	104.6	12	89.8	39.1	42.1	35.8	38.6	8.4%
02p05	97.2	7	92.2	38.0	24.5	35.5	22.9	6.7%
02p09	88.3	16	84.6	33.3	45.1	32.0	43.4	3.9%
02p12	94.5	17	92.7	31.3	49.4	31.1	49.1	0.6%
02p15	82.8	9	84.2	30.8	23.4	34.2	25.9	-10.9%
02p19	53.1	20	69.0	28.7	39.7	27.5	38.0	4.2%
04p01	98.8	2	75.7	47.3	7.2	46.6	7.1	1.5%
04p10	123.5	1	129.6	42.7	5.5	42.4	5.5	0.7%
05p03	103.2	3	107.5	53.5	17.3	59.0	19.0	-10.3%
05p08	121.2	2	121.8	42.7	10.4	52.0	12.7	-21.7%

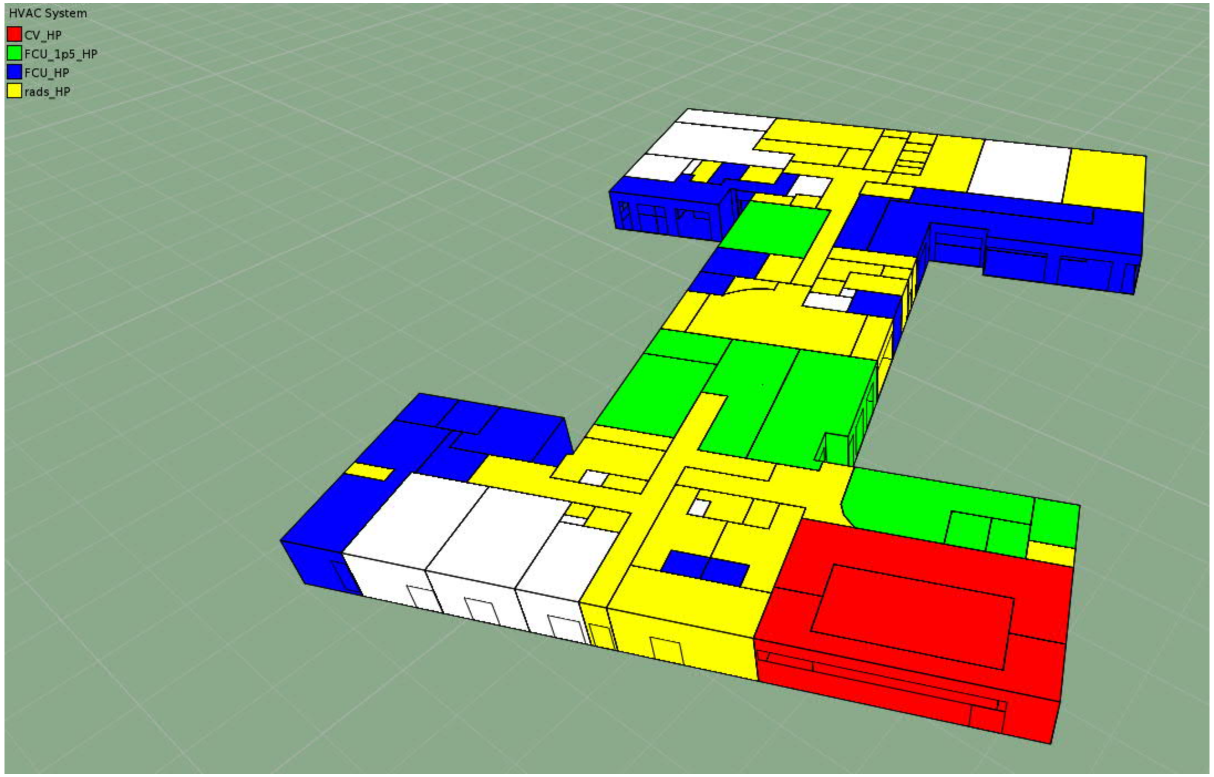
Total	264.6	Total	262.1	0.9%

Item 13: Non domestic Overheating

The floor plan below shows uses for each space on the ground floor of the proposed development.

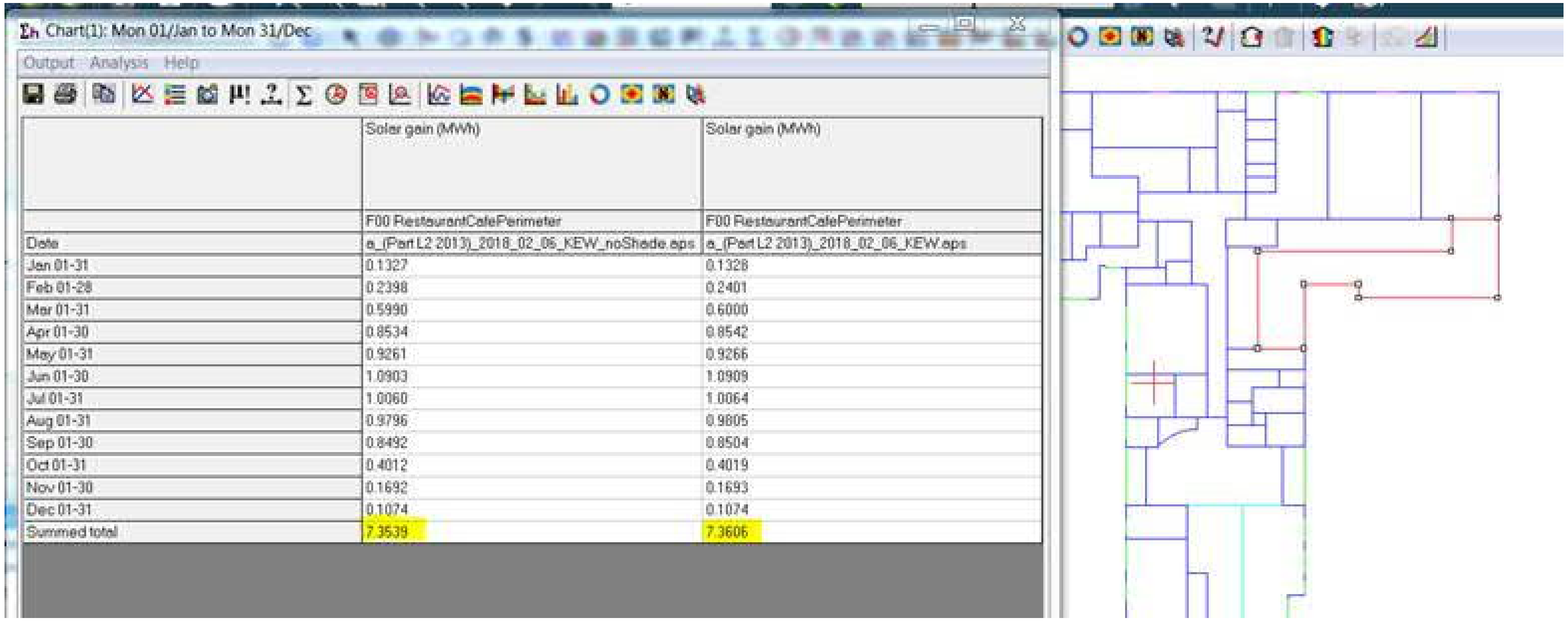


The extract below shows the system applied to each of these spaces.
Only yellow and white areas are uncooled.



Unconditioned spaces are risers, plant rooms, and the cycle storage rooms.
Heated only spaces are circulation spaces and changing rooms. All other spaces are cooled.

Initial IES results showing apparent minimal contribution from restaurant sunshades



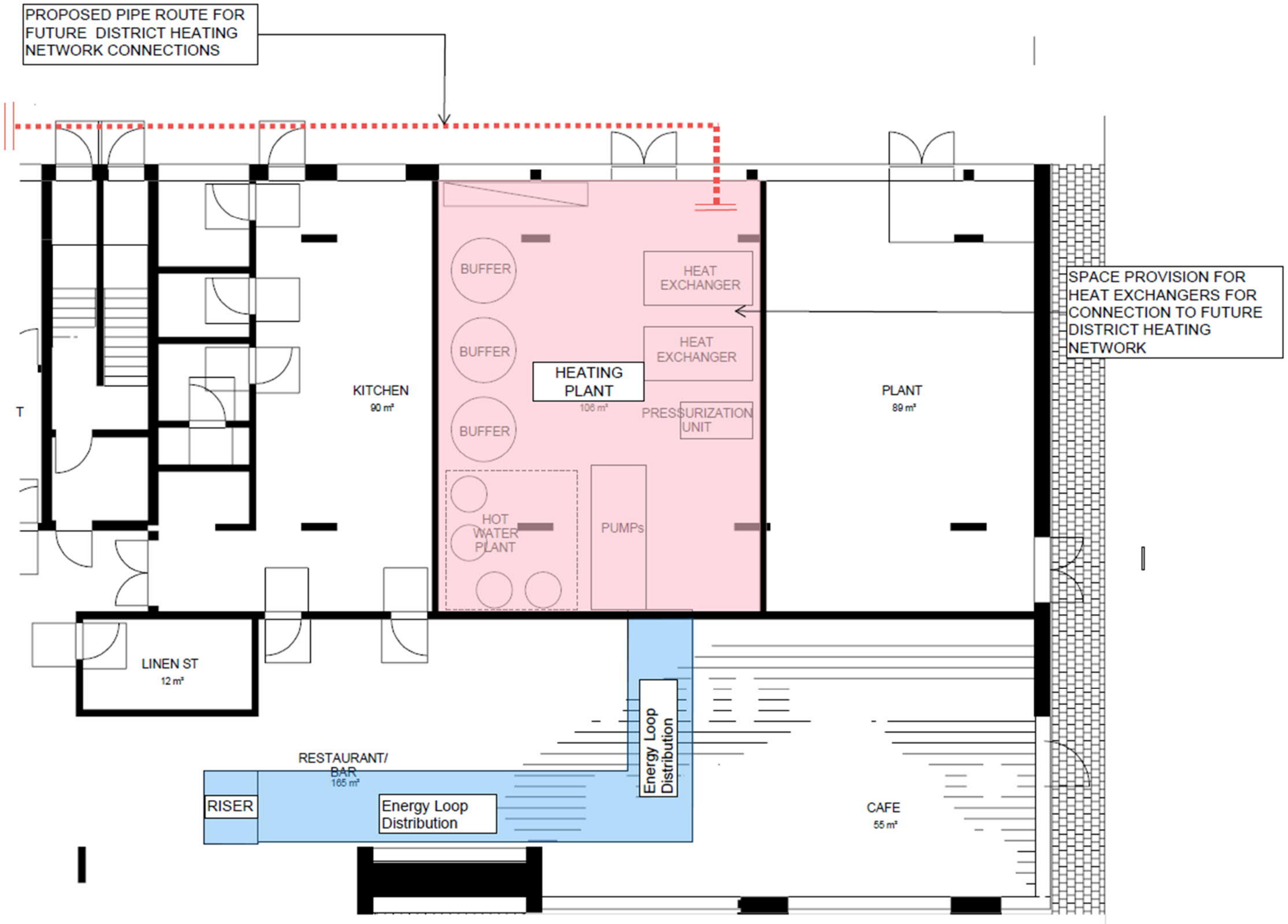
	Solar gain (MWh)	Solar gain (MWh)
	F00 RestaurantCafePerimeter	F00 RestaurantCafePerimeter
Date	a_(Part L2 2013)_2018_02_06_KEW_noShade.aps	a_(Part L2 2013)_2018_02_06_KEW.aps
Jan 01-31	0.1327	0.1328
Feb 01-28	0.2398	0.2401
Mar 01-31	0.5990	0.6000
Apr 01-30	0.8534	0.8542
May 01-31	0.9261	0.9266
Jun 01-30	1.0903	1.0909
Jul 01-31	1.0060	1.0064
Aug 01-31	0.9796	0.9805
Sep 01-30	0.8492	0.8504
Oct 01-31	0.4012	0.4019
Nov 01-30	0.1692	0.1693
Dec 01-31	0.1074	0.1074
Summed total	7.3539	7.3606

Amended results showing 3% improvement.

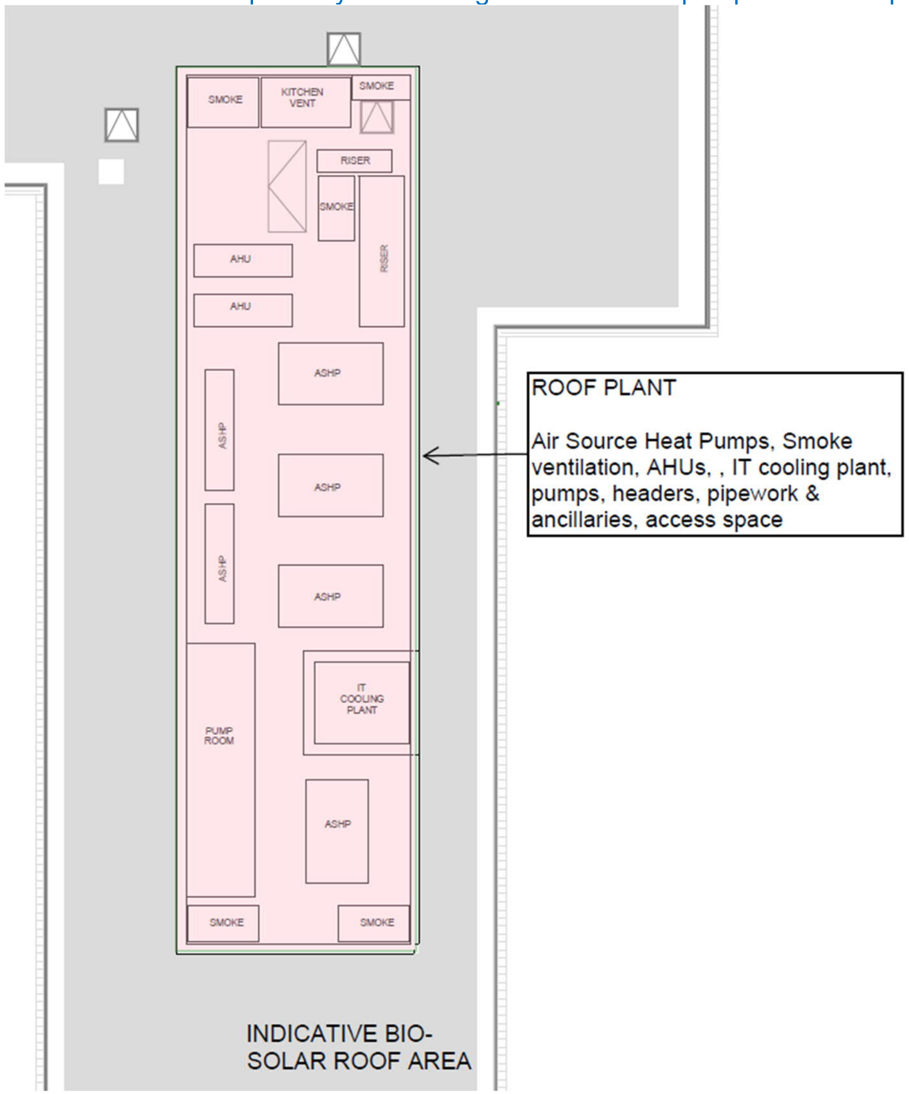
	With Shade		
	CO_2	Cooling	Solar Gain
Actual (No Shade)	25.7	96.67	55.23
Actual (With Shade)	25.6	94.30	51.81
Notional	27.2	77.16	47.87
No Shade	5.5%	-25.3%	-15.4%
With Shade	5.9%	-22.2%	-8.2%

For Item 15 and 19:

Ground floor indicative block plant layout showing primary heating plant and potential route for future district heating pipework.



Indicative roof block plant layout showing air source heat pumps and other proposed MEP plant.

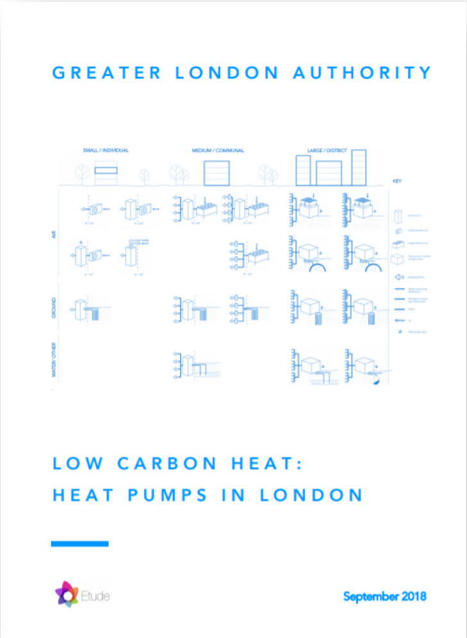


For Item 19:

This short text compares the proposed ambient loop air source system with a “traditional” high temperature heat pump system. It is in response to the GLA Response 2 to point 19:

- The system provides carbon savings beyond a traditional high temperature heat pump system in these circumstances.

Much of the data for this response is taken from the GLA Low Carbon Heat: Heat Pumps in London September 2018.



Quoting from this report:

In order to deliver low carbon and affordable heat, the efficiency of heat pumps needs to be better understood by the building industry. The use of low temperature distribution systems and emitters, the method used to generate domestic hot water and the correct installation and commissioning of heat pump systems can all help to deliver low carbon emissions and operational energy costs. Heat pumps should not be seen as direct like-for-like replacements for gas-fired CHP.

The proposed ambient loop system will benefit from improved COPs for a few reasons:

- Condenser temperatures are expected to be lower in the ambient loop system as
    - there is no need to heat the water to such a high temperature
    - return water temperatures are in practice higher than the cold water feed / radiator return temperatures available to the distributed systems.
- Losses from high temperature district heat networks are significant, and zero in the ambient loop system.

Detail

Unpacking the points above requires consideration of how building wide district heating networks can actually work. It is useful to think of three classes:

- How these systems actually work in the real world, with all the errors and compromises made on site.
- The best these systems could theoretically perform, on paper.
- A fantasy system, that can't exist even in theory, but which would be very nice if it did.

This note will look at the gap between the second and third of these.

Return Temperatures

To produce DHW at 65C, the lower limit PH engineers typically specify for regions of legionella control, the flow temperature has been set to 70C. For the majority of the year, the units will be in “keep hot” mode with a constant requirement for hot water at 65C, but an extremely low load on the HIU compared to the losses in the pipes. In these times the return temperature will be at 60C.

Standing Losses

A model of the building was created in 3D, and assumed pipe lengths added for both flow and return. Following guidance in the heat network code of practice, multiple vertical risers have been used to reduce pipe lengths and thus losses:

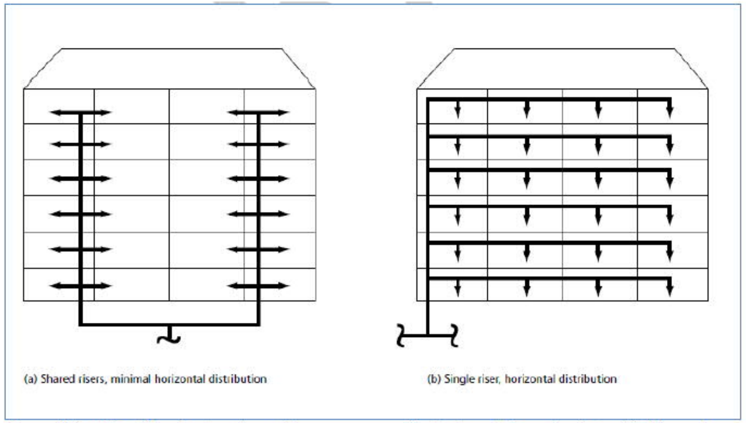
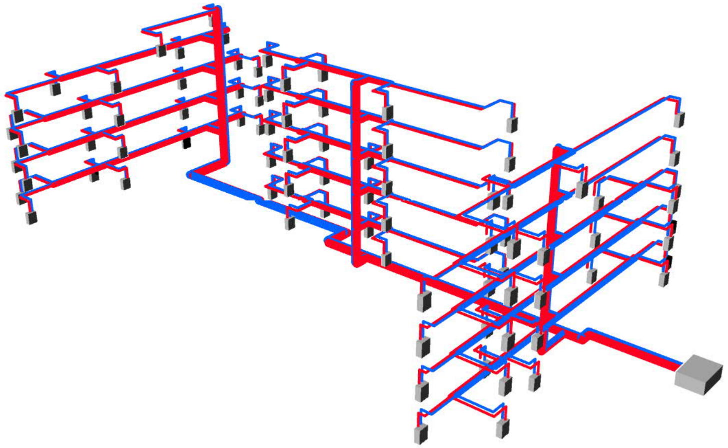


Figure 3.8 – Benefits of using shared risers compared to horizontal runs for typical flat layouts

The image below shows the layout of the notional building wide heating network for the upper floors, using typical UK practice. Flow and return pipes start at a heat generator at ground floor level, and terminate at a HIU in each apartment.



Measured pipe lengths are given in the table below:

		m
Flow	Single HIU Connection	470
Flow	Horizontal Distribution	261
Flow	Riser	114
Return	Single HIU Connection	267
Return	Horizontal Distribution	493
Return	Riser	109

Using insulation thicknesses from the district heating code of practice of

- 15mm for smaller pipes, and
- 20mm for thicker pipes,

and extremely high quality insulation with a conductivity of only 0.021 W/m/K gives a standing heat loss of 13kW.

Over the year this is 28% of the heat and DHW demand of the domestic areas. This is a much larger figure than the 5% assumed in SAP, the 10% figure used in the GLA heat pumps guide or the 15% “best practice” figure from the district heating code of practice. The 15% figure appears unachievable even in theory as doubling the thickness of insulation still results in a 20% loss.

The figures above are the theoretical maximum figures. They assume that the insulation is perfectly fitted everywhere, do not include losses from the HIU themselves, and assume the flow and return pipes hang happily in space, rather than being attached by hangers with the associated heat losses. The theoretical figure of 28% losses will be used from now on.

To see if this is typically achievable at the higher temperatures, we again turn to the GLA Heat Pumps in London document. Table 4.02 reproduced below shows typically air-water efficiencies of 3.84 are not achieved at the high temperature of 65ºC.

The low temperature distribution system has been modelled with a COP of 3.0 based on manufactures data. To compensate for the minimum theoretical losses a higher temperature distribution system will need to have a COP of at least 3.0 * (100%+28%) = 3.84.

Heat pump type	Efficiency at specific flow temperature (SCOP)					Typical average efficiency
	35°C	45°C	55°C	60°C	65°C	
air-air	300%	-	-	-	-	300%
air-water	340%	300%	250%	210%	170%	260%
ground-water	385%	365%	335%	305%	285%	320%

Table 4.02 – Heat pump efficiencies (SCOP) used in this study[10]

For these reasons, together with the associated overheating problems caused by high temperature systems, and that the building’s occupants will be particularly sensitive to overheating, a low temperature loop is still the recommended option.

For Item 22:

b) Manufacturer's guidance on entering the ambient temperature heat pump system into Part L modelling software

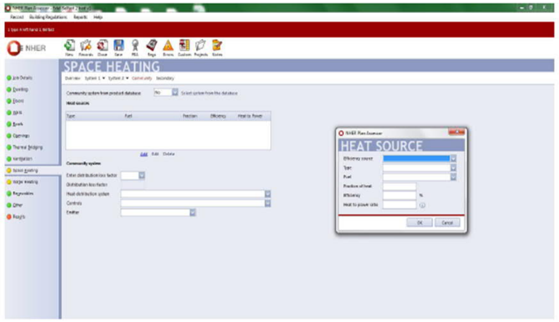
zeroth
energy system

Zeroth and putting the solution through SAP (2012)

Glen Dimplex Heating and Ventilation are currently undertaking in depth consultation with the Building Research Establishment (BRE) on how to correctly model the Zeroth Energy System within SAP. This document outlines two interim methods, which have been approved by the BRE, for use while the SAP methodology is suitably amended for SAP 10.

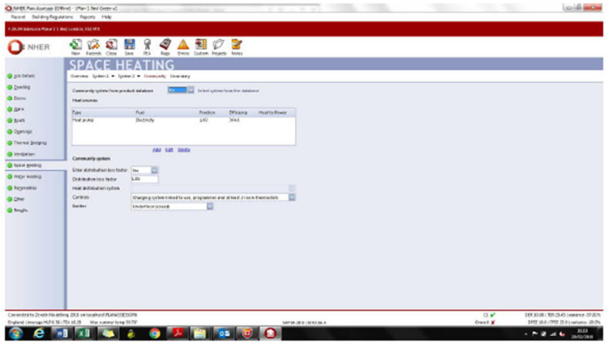
Overview

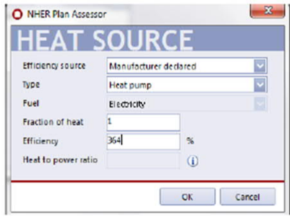
SAP is a calculation methodology used to prove compliance of a dwelling to Part L of the England/Wales Building Regulations and Section 6 of the Scottish building Regulations. SAP is regulated by the BRE and both the software and assessors have to be accredited in order to perform the analysis. SAP analysis is typically conducted at two stages during the build cycle; as part of the planning submission and building completion. These stages are referred to as "design" and "as built". For the majority of projects, assessors are able to simply select a technology (for example an Air Source Heat Pump) and either input the efficiency or select the product from a database, where the products are listed by manufacturer (commonly referred to as Sap Appendix Q). Normally when designing a community heat network using technologies such as gas CHP and boilers, the assessor simply enters some details about the central plant and intended controls.



Route 1: Zeroth with Heat Pumps

One of the most energy efficient ways to use Zeroth is with heat pumps as the central plant. The method provided by the BRE requires the assessor to either model the heat network with a default efficiency for heat pumps at 300% or if the ASHP SCOP is known (calculated to BSEN 14825) then this can be added to the box, as manufacturer declared. The value shown is for the Dimplex LA 60 TU or LA 60 TUR+ models. A distribution loss factor of 1.05 can be adopted for the network efficiency.

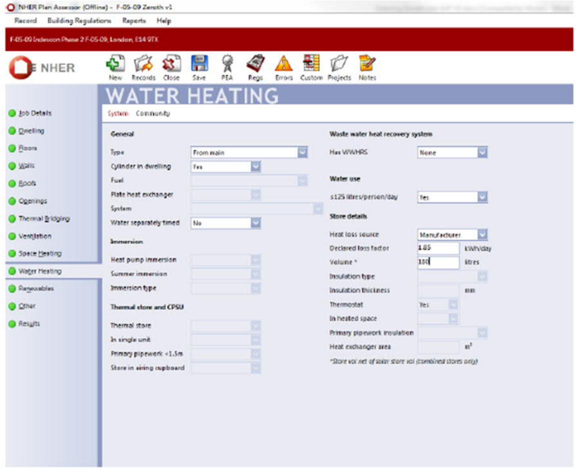




General considerations

When modelling the Zeroth Energy System, it is important to remember that hot water services are provided using a cylinder. Therefore, the SAP assessor will need to enter the relevant values:

- Cylinder in dwelling
- Cylinder Volume – 180L
- Heat loss from cylinder – manufacturer declared
- Value – 1.85 kwh/day



c) Manufacturer's heat pump performance details (based on Glen Dimplex Zeroth Apartment Heat Pump with integrated cylinder)

Performance		ZHP4H-170	ZHP6H-170
Heating Capacity	kW	4	6
Required Capacity from Loop	kW	3.2	4.8
Coefficient of performance Heating	W25/W35	8.0	8.3
Coefficient of performance Heating	W25/W55	4.0	4.3
Nominal Flow Rate from loop	m^3/h	0.55	0.85
Loop operating range	°C	15-25 on a 5K delta T	
Maximum Static Pressure Rating	Bar	10	
Minimum Heating flow rate	m^3/h	0.7	1.03
Max Heating Flow Temperature	°C	55	
Sound power level at 1m	dB(A)	43	
Refrigerant	Type/kg	R410A/0.82	
Available Pump Head (Heat)	kpa	53 @ 0.7 m^3/h	39 @ 1.03 m^3/h
Available Pump Head (Loop)	kpa	53 @ 0.55 m^3/h	39 @ 0.85 m^3/h
Dimensions and connections			
Dimensions	mm	550 x 550 x 2000	
Filled Weight	kg	363	
Weight without packaging (empty)	kg	178 or 110/68 split	
Loop connections	mm	22 copper stub	
Heating/Cooling connections	mm	22 copper stub	
Drain Discharge (19mm clear hose)	mm	1.5m length supplied loose	
Discharge (G3 T and P Valve)	mm	15	
Cold Mains inlet to cylinder	mm	22 copper stub	
Hot Water outlet/return	mm	22 copper stub	
IP rating		IPX4	
Expansion Vessel (heating)	Litre	8	
Electrical			
Nominal Power Consumption Heat Pump, inc pumps (W25/W35)	kW	0.6	0.82
Electrical supply Immersion (230v)	A/Rating	9A with 10A Type B RCBO	
Electrical supply HP Module (230v)	A/Rating	13A with 16A Type C RCBO	
Number of Electrical supplies		2	
Hot water cylinder			
Type		Unvented	
Material		Stainless Steel	
Insulation		EPS Foam	
T&P Valve Rating		6 Bar or 95°C	
Maximum water inlet pressure	bar	6	
Capacity	L	180	
Integrated electric immersion	kW	2	
Maximum temperature with immersion	°C	70	
Water regulations		G3 KIWA approval to EN12897	
T&P valve		Factory fitted	
Standing heat loss	kWh/24h	1.85	
Cylinder heat up time (from 10 to 60°C)	hrs	2.5	1.7
Accessories Supplied Loose		Tundish, preformed discharge pipework, 1.5m hose, adjustable feet	