

Haringey Civic Centre

Energy Statement

HCC-BHE-XX-XX-RP-YS-000004

0055xxx

4 September 2023

Revision P03

Revision	Description	Issued by	Date	Checked
P01	Issued for information – planning draft	IS	09.03.2023	
P02	Issued for Information – planning	LW	15.03.2023	IS
P03	Update based on stage 3+ and planning comments	DRK	04.09.2023	DRK

Report Disclaimer

This Report was prepared by Buro Happold Limited ("BH") for the sole benefit, use and information of Haringey Borough Council for Planning. BH assumes no liability or responsibility for any reliance placed on this Report by any third party for any actions taken by any third party in reliance of the information contained herein. BH’s responsibility regarding the contents of the Report shall be limited to the purpose for which the Report was produced and shall be subject to the express contract terms with Haringey Borough Council. The Report shall not be construed as investment or financial advice. The findings of this Report are based on the available information as set out in this Report.

author

Kevin Becerril

date

1 September 2023

approved

David Kingstone

signature



Digitally signed by
David Kingstone
Date: 2023.09.04
09:36:57+01'00'

date

4 September 2023

..

Contents

1	Executive summary	8
2	Site Analysis	9
2.1	Sun path diagram	9
2.2	Wind	11
2.3	Rainfall	11
2.4	Site Opportunities and Constraints	11
3	Building Physics Energy Strategy	12
3.1	General Energy Strategy	12
3.2	Carbon Factors	12
3.3	Fabric Performance	13
3.3.1	Existing Civic Centre	13
3.3.2	New Annexe	13
3.4	MEP System design	13
3.4.1	Ventilation	13
3.4.2	Heating	14
3.4.2.1	Building Management System	14
3.4.3	Domestic Hot water	14
3.4.4	System efficiency	14
3.5	District energy networks	14
3.6	Electric efficiency	14
3.7	Renewable energy	15
4	Part L results	16
4.1	Energy Baseline Demand CO2 Emissions – ‘TER’	16
4.1.1	Baseline Demand and CO2 Emissions	16
4.1.2	Part L2A Regulated Emissions	16
4.1.3	Unregulated emissions	16
4.1.4	Baseline predicted energy demand	16
4.1.5	Baseline’ carbon emissions	17
4.2	Energy Demand Reduction – ‘Lean’	17

4.2.1	Passive Design	17	5.5.2	Operational costs	25
4.2.2	'Lean' NCM Energy Demand	17	5.6	Disclaimer	25
4.2.3	'Lean' Carbon Emissions	17	Appendix A Operational Energy Model Assumptions		26
4.3	Air Source Heat Pump Improvement – 'Clean'	17	Appendix B GLA Emissions Reporting Development Information		32
4.3.1	'Clean' NCM Energy Demand	17	Appendix C BRUKL Documents		35
4.3.2	'Clean' Carbon Emissions	18			
4.4	Energy Renewable Energy – 'Green'	18			
4.4.1	'Green' predicted energy demand	19			
4.4.2	'Green' Carbon Emissions	19			
4.4.3	Energy Hierarchy Summary	19			
4.5	Ventilation and Thermal overheating mitigation and the GLA Cooling Hierarchy	21			
5	Operational Energy calculations	22			
5.1	Overview	22			
5.1.1	The energy consumption estimate	22			
5.1.2	The Assumptions	22			
5.2	Introduction	22			
5.3	Input data and assumptions	23			
5.3.1	Estimating energy using a simulation	23			
5.3.2	HVAC software simulation package and model	23			
5.3.3	Climate data	23			
5.3.4	The building	23			
5.3.5	Internal gains	24			
5.3.5.1	Occupancy gains	24			
5.3.5.2	Lighting	24			
5.3.5.3	Equipment	24			
5.3.6	Mechanical systems	24			
5.3.6.1	Domestic hot water	24			
5.3.7	Lifts	24			
5.4	Onsite renewable energy generation	24			
5.5	Simulation Results	25			
5.5.1	Estimated energy use	25			

Table of Tables		Table 5—6 Internal loads	27
Table 1—1 Site-Wide predicted regulated CO ₂ emissions and savings at each Energy Hierarchy stage (Part L 2021) 8		Table 5—7 Internal gains profiles	27
Table 1—2 Be Seen predicted EUI	8	Table 5—8 DHW usage profiles	29
Table 3—1 Civic Centre Fabric Performance	13	Table 5—9 ASHP and WSH seasonal efficiencies	29
Table 3—2 Fabric upgrade elements for key areas	13	Table 5—10 water source heat pump part load profile	29
Table 3—3 New Annexe Fabric Performance	13	Table 5—11 DHW system assumptions	29
Table 3—4 Lighting efficiencies for energy models	14	Table 5—12 AHU operational assumptions	30
Table 3—5 Stage 3+ PV details	15	Table 5—13 Miscellaneous system fan assumptions	30
Table 3—6 Stage 3+ PV contribution	15	Table 5—14 Lift energy consumption data	30
Table 4—1 Specifications comparison between the Baseline and Lean buildings of the existing Civic Centre	16	Table 5—15 Energy end use category definitions	31
Table 4—2 Predicted ‘Baseline’ energy demands	17	Table 5—16 Summary of energy consumption breakdown by end use	31
Table 4—3 Predicted ‘Baseline’ carbon emissions (SAP 10.2 carbon factors)	17		
Table 4—4 Predicted ‘Lean’ energy demands	17		
Table 4—5 Predicted ‘Lean’ carbon emissions (SAP 10.2 carbon factors)	17		
Table 4—6 Predicted ‘Clean’ energy demands	17		
Table 4—7 Predicted ‘Clean’ carbon emissions (SAP 10.2 carbon factors)	18		
Table 4—8 Haringey Civic Centre LZC feasibility	18		
Table 4—9 Predicted ‘Green’ energy demands	19		
Table 4—10 Predicted ‘Green’ carbon emissions (SAP 10.2 carbon factors)	19		
Table 4—11 Site-Wide predicted regulated CO ₂ emissions and savings at each Energy Hierarchy stage (Part L 2021) 19			
Table 4—12 Existing Civic Centre predicted regulated CO ₂ emissions and savings at each Energy Hierarchy stage (Part L 2021)	20		
Table 4—13 New Annexe predicted regulated CO ₂ emissions and savings at each Energy Hierarchy stage (Part L 2021)	20		
Table 4-14 Cooling hierarchy, mitigation measures based on GLA guidance	21		
Table 4—15 Cooling demand	21		
Table 5—1 PV generation	25		
Table 5—2 Estimated operational costs	25		
Table 5—3 Floor areas	26		
Table 5—4 Operational hours	26		
Table 5—5 Building fabric performance	26		

Table of Figures

Figure 1—1 Haringey Civic Centre Site-Wide Carbon Savings throughout the energy hierarchy (Part L 2021)	8
Figure 1—2 Operational energy results	8
Figure 2—1 Haringey Civic Centre proposed front elevation	9
Figure 2—2 Sun path view over site (plan view)	9
Figure 2—3 Sun path view from west side	10
Figure 2—4 Psychometric chart -Typical winter in London during occupied hours	10
Figure 2—5 Psychometric chart – March to November during occupied hours	10
Figure 2—6 Psychometric chart – London summer 2080.	11
Figure 2—7 London Wind Rose	11
Figure 2—8 30 year monthly average rainfall in London	11
Figure 3—1 Haringey Energy Hierarchy	12
Figure 3—2 Carbon Emission Factors	12
Figure 3—3 FCU system layout with fresh air supply	13
Figure 3—4 Architectural layout of Solar PV areas	15
Figure 4—1 Haringey Civic Centre Site-Wide Carbon Savings throughout the energy hierarchy (Part L 2021)	19
Figure 4—2 Existing Civic Centre Carbon Savings throughout the energy hierarchy (Part L 2021)	20
Figure 4—3 New Annexe Carbon Savings throughout the energy hierarchy (Part L 2021)	20
Figure 4-4 GLA Cooling Hierarchy	21
Figure 5—1 Estimated Annual Energy Consumption	22
Figure 5—2 IES VE energy model site geometry – annex view	22
Figure 5—3 IES VE energy model site geometry – civic centre view	23
Figure 5—4 TRY 2020 weather files used in the baseline model	23
Figure 5—5 Energy model geometry – building	24
Figure 5—6 Energy consumption estimate	25

Glossary

Term	Definition
AC	Air Conditioning
AHU	Air Handling Unit
ASHP	Air Source Heat Pump
BER	Building Emission Rating
BH	Buro Happold
BMS	Building management system
CHW	Chilled Water Service
CIBSE	Chartered Institute of Building Services Engineers
CO ₂	Carbon Dioxide
COP	Coefficient of Performance
DHW	Domestic Hot Water
EUI	Energy Use Intensity
FCU	Fan coil unit system
FM	Facilities Management
GIA	Gross Internal Area
GLA	Greater London Authority
GSHP	Ground Source Heat Pump
HVAC	Heating Ventilation & Air Conditioning
ICT	Information and communication technology equipment
LED	Light Emitting Diode
LETI	London Energy Transformation Initiative
LTHW	Low Temperature Hot Water (<100°C – 60 °C)
LZC	Low and Zero Carbon
MEP	Mechanical Electrical and Public health
MVHR	Mechanical Ventilation Heat Recovery
NCM	National Calculation Methodology
NIA	Net Internal Area
NLA	Net Lettable Area
POE	Post-occupancy evaluation
POU	Point of use
PV	Photovoltaic (solar panels)
RIBA	Royal Institute of British Architects
SCOP	Seasonal Coefficient of Performance
SEER	Seasonal Energy Efficiency Ratio
SFP	Specific Fan Power
SHGC	Solar Heat Gain Coefficient
Simulation	The building energy model used to estimate of the energy consumption of the Project and create an EUI for the building.
TER	Target Emission Rating
TRY	Test Reference Year
UKGBC	United Kingdom Green Building Council
ULTHW	Ultra-Low Temperature Hot Water (<45°C – 30 °C)

Term	Definition
VRF	Variable Refrigerant Flow Cooling / heating System
VAV	Variable Air Volume Box
WC	Water Closet
WHB	Wash Hand Basin
WSHP	Water Source Heat Pump
WWR	Window to Wall Ratio

1 Executive summary

This report details the energy strategy for the Haringey Civic Centre buildings located at 255 High Rd, London N22 8LE. The Haringey civic centre is a grade II listed building undergoing a major refurbishment connecting to a new building with a total GIA of 10,003m².

The analysis has followed the GLA energy hierarchy; first applying lean measures such as consideration of highly efficient fabric and low air tightness of the building to reduce energy consumption, before then applying efficient systems and renewable technologies. The development is driving towards a Net Zero Carbon target.

The whole site, including the existing Civic Building and the New Annex, was shown to achieve cumulative on-site carbon dioxide emissions savings of 53% of which 23% were accounted for by the Be LEAN savings. This achieves the current London Plan target of 35% and 15% savings respectively.

The carbon offset necessary to meet the zero carbon policy has been calculated at just under 940 Tonnes of CO₂ equivalent to around £89,300 based on the default GLA carbon price of £95/tonne.

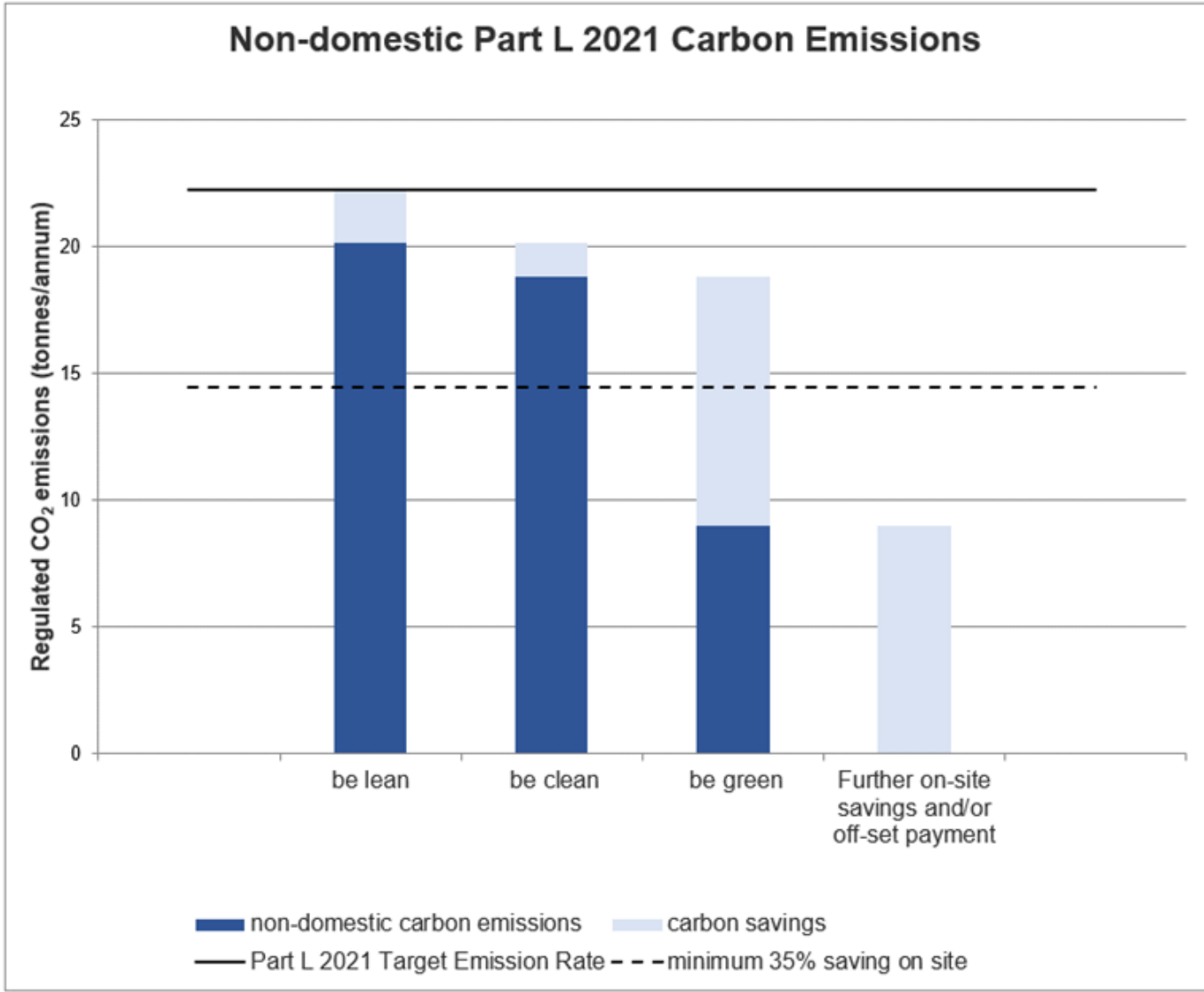


Figure 1—1 Haringey Civic Centre Site-Wide Carbon Savings throughout the energy hierarchy (Part L 2021)

Table 1—1 Site-Wide predicted regulated CO₂ emissions and savings at each Energy Hierarchy stage (Part L 2021)

Part L 2021	Total regulated emissions (Tonnes CO ₂ /year)	CO ₂ savings (Tonnes CO ₂ /year)	Percentage saving (%)
Part L 2021 Baseline	66.5		
Be Lean: savings from energy demand reduction	50.9	15.6	23%
Be Clean: savings from heat network	47.2	3.6	5%
Be Green: savings from renewable energy	31.3	15.9	24%
Cumulative on-site savings		35.1	53%
		CO ₂ savings off-set (Tonnes CO ₂)	CO ₂ off-set payment (£)
Total Site Wide Off Set		939.9	89,290.5

A prediction of operational energy consumption using advance simulation modelling in accordance with CIBSE TM54 requirements as part of the GLA Be Seen approach was also completed and compared with the Energy In Use (EUI) targets. The heating energy demand for the new annex was shown to be 18% less than the targeted 15kWh/m².

Table 1—2 Be Seen predicted EUI

Be Seen	Target EUI (kWh/m ²)	Predicted EUI (kWh/m ²)	Notes
Civic Building	225	148	RIBA 2030 Climate Change Target. Current existing building EUI 250kWh/m ²
New Annex	90	89	UKGBC Net Zero Carbon operational energy 2025 - 2030
Total	155	118	

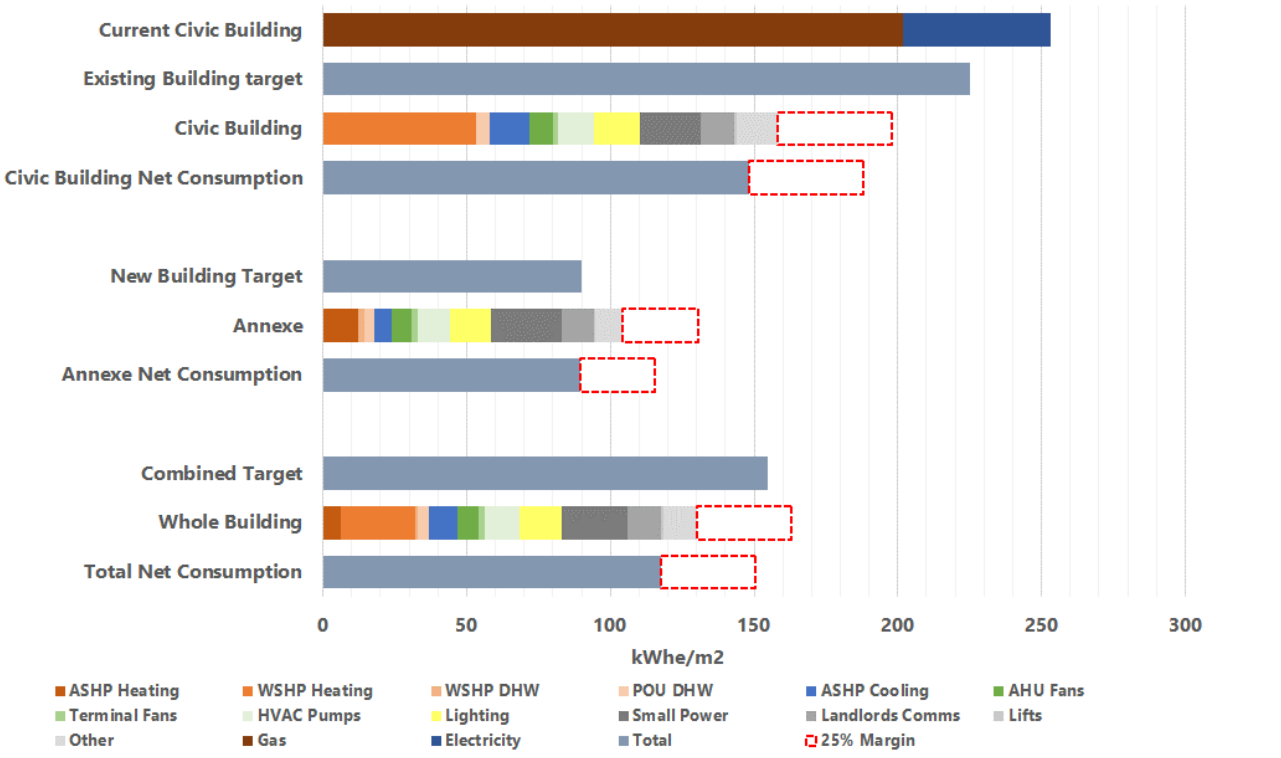


Figure 1—2 Operational energy results

2 Site Analysis



Figure 2—1 Haringey Civic Centre proposed front elevation

To assess the external conditions, weather information has been taken from CIBSE weather data, using the London Weather Centre 2020 (DSY1, high 50) weather file. To future proof the design, further temperature analysis was done using the London Weather Centre 2080 (DSY1, high 50) weather file. This information is shown graphically below and has been produced using Rhino 6 software. Additionally, rainfall data has been taken from data recorded by the Met Office; future projections for rainfall are not readily available.

2.1 Sun path diagram

A sun path diagram displays the route that the sun takes over a certain location over the course of a day and year. This is expressed using the cardinal directions (North, South, East, West) relative to the location. This can be used to inform the design of the glazing, to optimise the solar heat gains in beneficial locations, control glare, whilst maximising useful daylighting. It can also be used to advise on the optimal direction for PV arrays.

Figure 2—2 shows the sun path over the site in plan view. The red arrow shows the sun path during the summer solstice and the blue arrow show the sun path during the winter solstice. Each yellow line shows the position of the sun at an hour of the day, tracking how this change across the year's months.

The plan diagram shows that the Sun rises in the east, peaks in the south (and is predominantly southerly during the day) and sets in the west. As such, the south facades will likely require the most shading, or minimal amounts of glazing in order to mitigate overheating and glare risks. The glazed façade of the listed existing civic centre building is a protected feature, and as such it's visual appearance must be retained. This may particularly pose a challenge on the west façade where the impact of the late afternoon sun and external air temperatures will be exacerbated by areas where the glazing

ratio is of over 80%. As the northern façades pose very little risk to overheating it can be considered beneficial to orient the new build's glazing mostly on this façade to increase daylight levels.

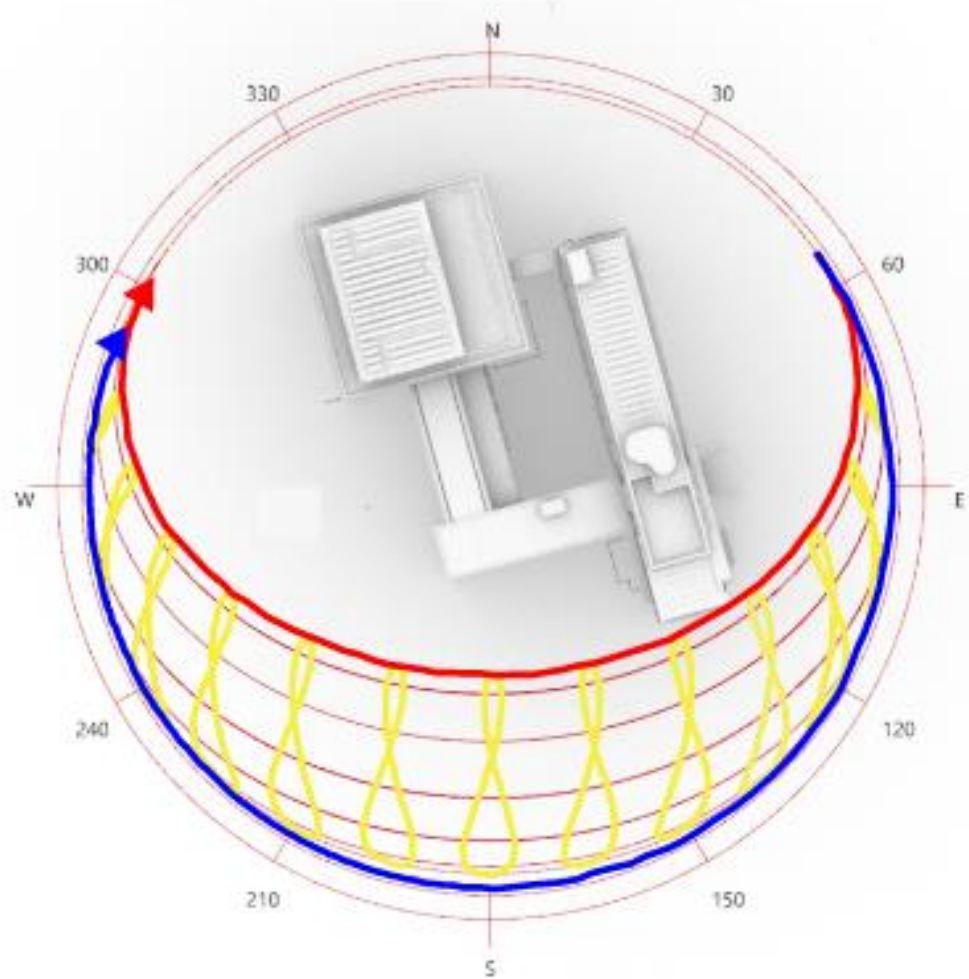


Figure 2—2 Sun path view over site (plan view)

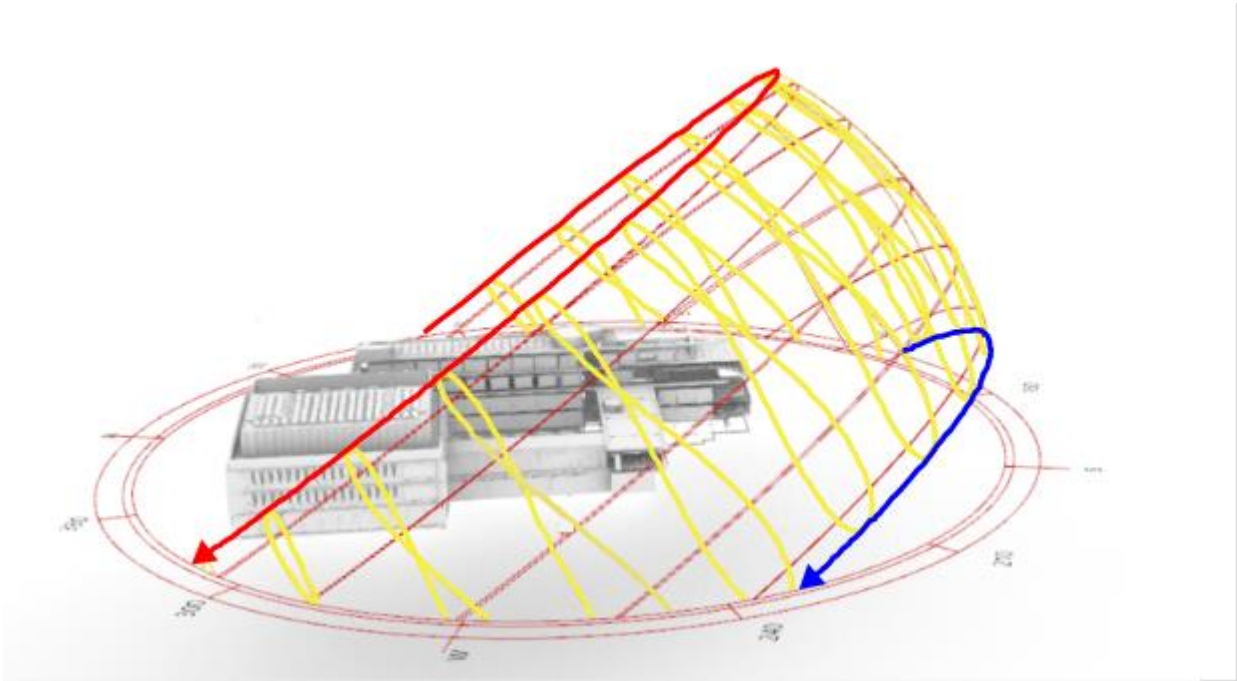


Figure 2—3 Sun path view from west side

Figure 2—3 Shows the sun path from the west. It can be seen that the south will receive most of the solar radiation throughout the year. Therefore, in order to maximise PV potential, they will need to be placed facing south and should not be overshadowed from the south.

Temperature and Humidity

Figure 2—4 shows the dry-bulb and wet-bulb temperature distribution over the course of the typical winter in London, during the buildings' occupied hours. And Figure 2—5 shows the same distribution between March and November.

From

Figure 2—4 it can be seen that in the winter months the outside air temperature well below the comfortable range, with over 39 hours spent at 10 degrees. This shows that natural ventilation is unsuitable during the winter months. In Figure 2—5 it can be seen that on some days the temperatures exceed 30°C, indicating that comfort cooling for the hottest days of the year will be necessary.

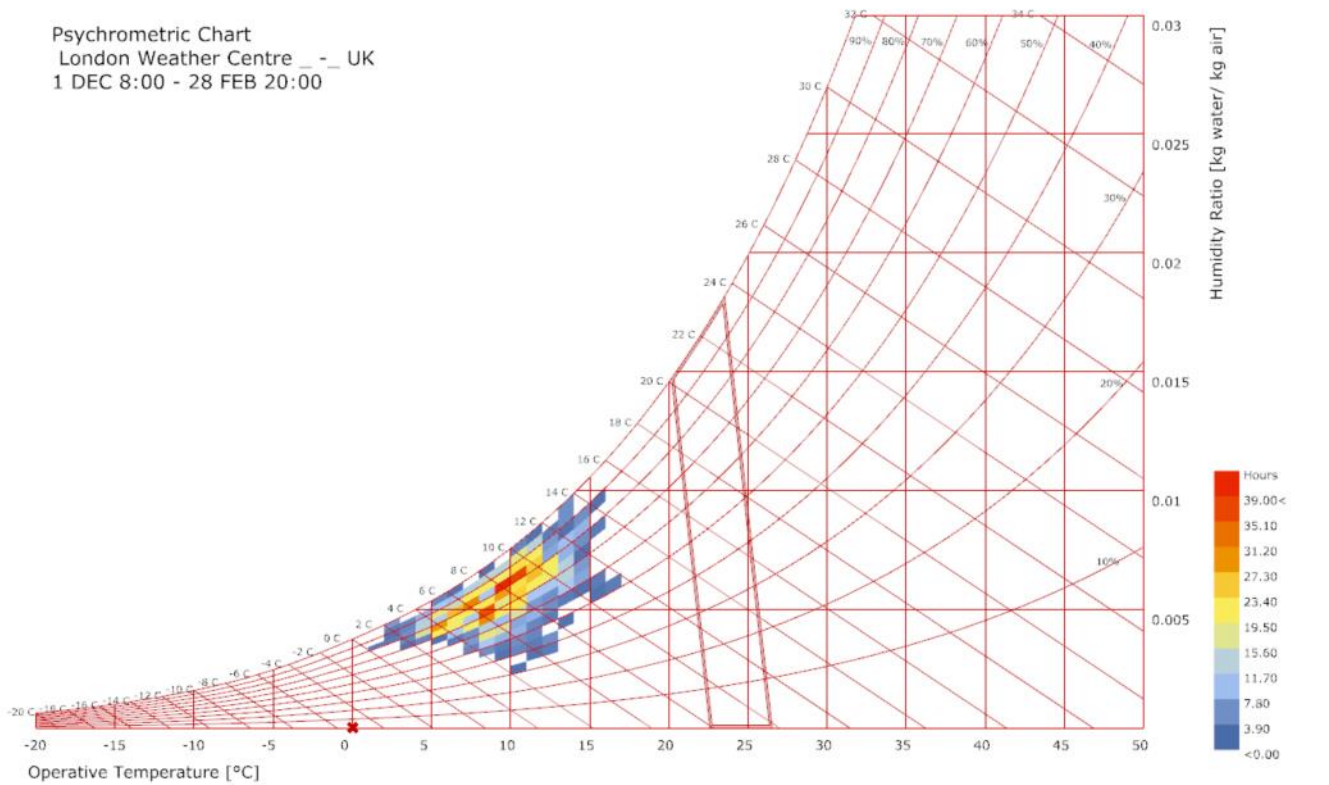


Figure 2—4 Psychrometric chart -Typical winter in London during occupied hours

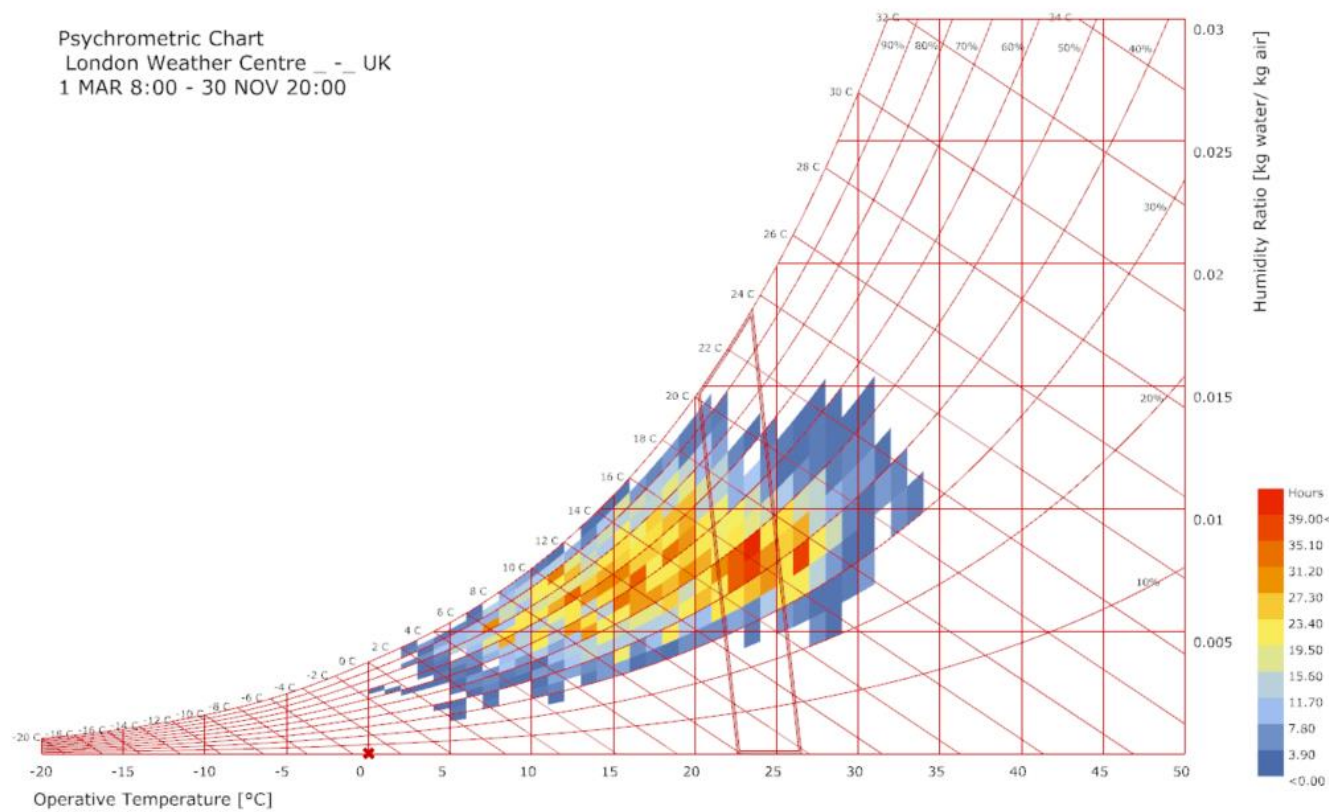


Figure 2—5 Psychrometric chart – March to November during occupied hours

Figure 2—6 below shows the psychrometric chart for a future summer in 2080. The chart shows that a significant number of hours will be spent above 30 degrees Celsius in 2080.

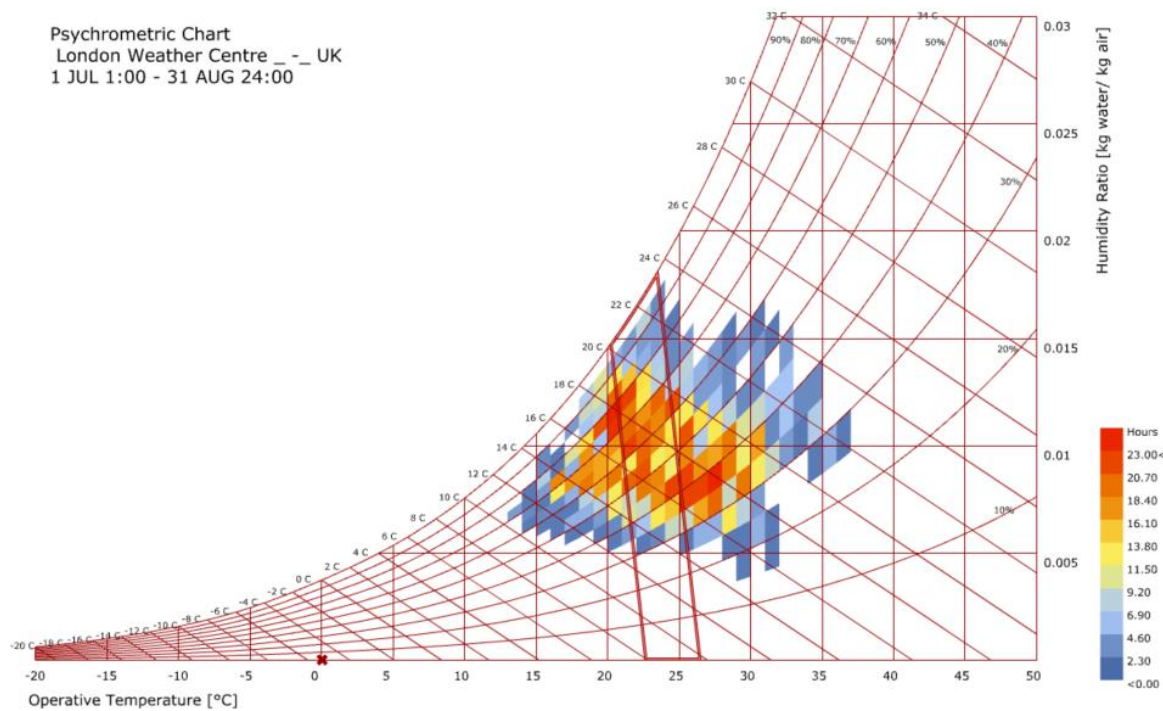


Figure 2—6 Psychrometric chart – London summer 2080.

2.2 Wind

Figure 2—7 shows the wind rose for London over the course of a full year. A wind rose graphically displays the typical distribution of wind speeds and directions over a specified location. Whilst this wind rose shows that there is a significant wind direction bias in the south-south westerly direction it can also be seen that there is a generally consistent steady breeze throughout the year.

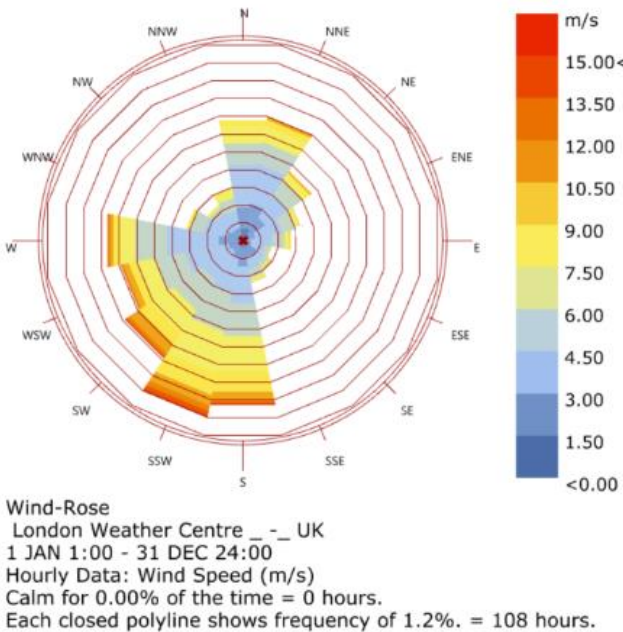


Figure 2—7 London Wind Rose

However, although the wind speeds are high enough to support natural ventilation, they do not appear to be sufficient for the use of wind turbines, which typically require continuous wind speeds of at least 15m/s to operate effectively.

2.3 Rainfall

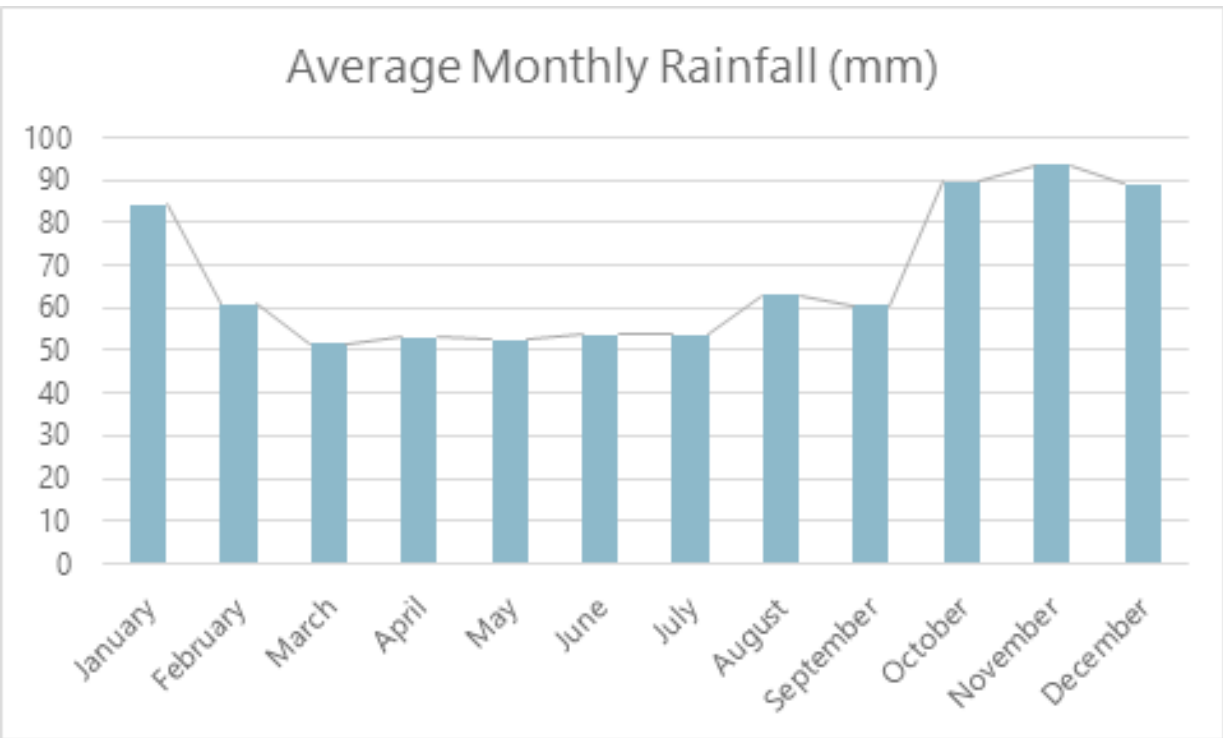


Figure 2—8 30 year monthly average rainfall in London

Figure 2—8 shows the monthly average rainfall, based on 30-year averages (1990-2020) as recorded by the Met Office.

It can be seen that there is a generally steady level of rainfall throughout the entire year, with increased rainfall between October and January. This could potentially be exploited for rainwater harvesting, which can then be used for purposes such as irrigation.

2.4 Site Opportunities and Constraints

The previous sections shows that the weather conditions of the site provide many opportunities for the proposed development, particularly for the use of solar PV.

The PV potential is somewhat restricted by the limited roof space, as the annexe building roof needs to be used as heating and cooling plant space. This is explored in further detail in Section 0.

This development presents an opportunity to salvage and retain a heritage building. This provides a chance to improve the overall efficiency and operational carbon by introducing energy saving measures and state of the art MEP equipment. Updating MEP equipment may also improve the wellbeing of building occupants as, the internal environment can be redesigned to modern standards. A further benefit to refurbishing an old building is that this will save on embodied carbon when compared to a new build.

However, the heritage nature of the building also presents some constraints. The listed nature of the facades prevents major interventions such as altering glazing ratios, however opportunities such as upgrading glazing to double, or triple glazing is possible. Nevertheless, the high glazing ratios mean that solar heat gain and conductive heat loss through the western and eastern façade remain a challenge. This will inhibit the energy efficiency of the building.

3 Building Physics Energy Strategy

3.1 General Energy Strategy

The New Annex and Existing Civic Centre have an energy strategy that reflects the client targets and is in line with local policy; whilst developing a number of key measures to achieve a low energy and carbon building.



Figure 3—1 Haringey Energy Hierarchy

The key measures within the design strategy for the development to reducing carbon emissions in operation are set out below. By implementing this strategy, the development is compliant with the Building Regulations Part L notional building through Lean measures alone and exceeds the on-site carbon reduction target of 35% through supplementary Clean and Green measures.

Energy hierarchy step	Design measures
Lean	Façade configuration and specification designed to balance winter passive solar gains but avoid summer overheating
	Building fabric specification lower than Part L notional building and targeting LETI standards in the new building
	Low air permeability targeted
Clean	Future District Network connections installed in the systems
Green	Installation of Air Source Heat Pumps for space heating, cooling and domestic hot water Photovoltaic arrays proposed on roof areas wherever feasible for renewable electricity generation
Net Zero	Residual regulated carbon emissions will be offset as per GLA London plan to achieve net zero regulated emissions
Be Seen	The metering strategy for all buildings will be designed in line with building regulations and GLA's 'Be Seen' guidance to ensure the building energy consumption can be interrogated and controlled

The existing building is being refurbished, reducing overall whole life carbon and retaining the heritage of the area. The New annex is being built to meet sustainable targets through the fabric, system and PV strategy. Both buildings are fully electric.

3.2 Carbon Factors

As per the GLA assessment guidance issued in 2021, SAP 10 carbon factors will be reported against as well as Building regulations Part L2013 SAP 2012 carbon factors. Due to the new Building regulations Part L 2021, these carbon factors will be used for planning and compliance and performance assessments.

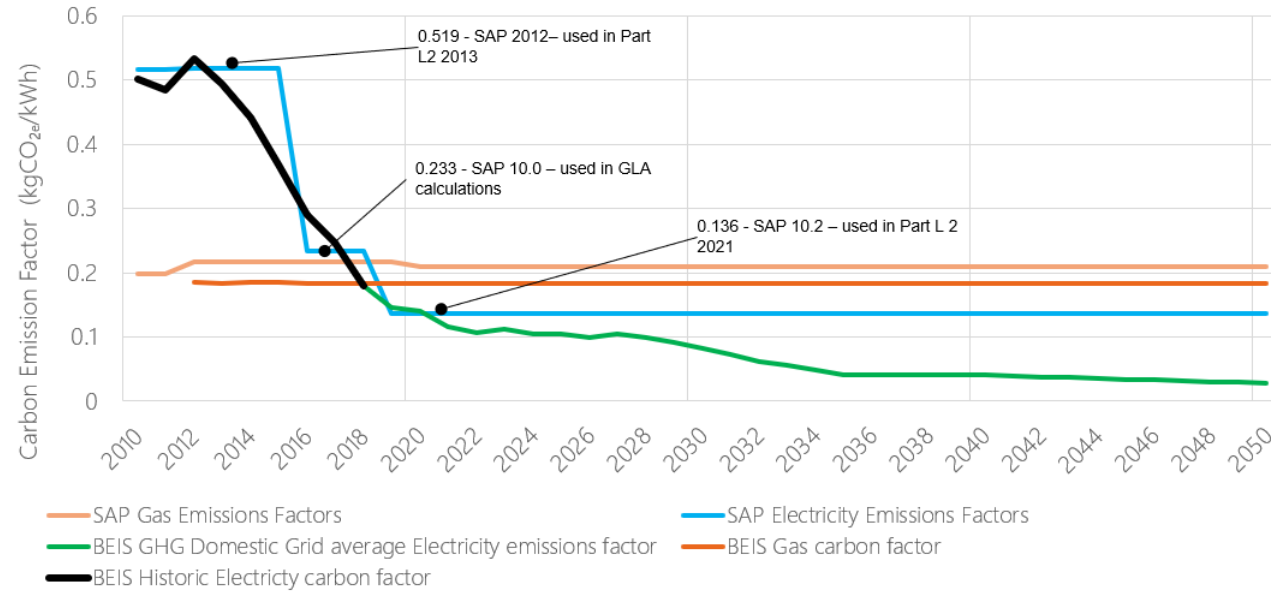


Figure 3—2 Carbon Emission Factors

3.3 Fabric Performance

3.3.1 Existing Civic Centre

The refurbishment of the existing civic centre includes additional servicing and treatment provision in certain areas therefore under approved document Part L2 the fabric is required to be upgraded to meet minimum standards. These standards are found in Approved document Part L 2021. Exceptions may be some listed areas and should be discussed with the heritage officer.

The existing building fabric is proposed to be thermally upgraded in accordance with the standards identified in Table 3—1. The approach to the insulation of walls varies by location and key areas, that require balancing of sustainability targets with heritage and cost challenges, are highlighted in Table 3—2. The renovation and replacement of thermal elements will provide considerable comfort and operational energy benefits to the building.

Table 3—1 Civic Centre Fabric Performance

Element	Targeted value	Unit	Notes
Exposed and ground floors	0.25	W/m²K	Existing uninsulated basement was better than the target and therefore no requirement to insulate the basement soffit.
Roof	0.18	W/m²K	
Wall – cavity insulated	0.30	W/m²K	
Wall – external or internal insulation	0.30	W/m²K	
Windows (U-Value)	1.80	W/m²K	Window replacement
Windows (G-Value)	0.40		
Air permeability	5.0	m³/hr/m² @50Pa	

Table 3—2 Fabric upgrade elements for key areas

Element	Sustainability comments
EWS01 - Brickwork with 65mm Cavity North Stair core	This space has been agreed to be upgraded for Stage 3+ design internal insulation and dry lining. This will achieve the required U value to have no impact on the Part L and EUI targets for the building.
EWS02 - Precast Concrete Cladding on 215mm Solid Brickwork Civic chamber with Internal finishes of marble and wooden panelling	The civic chamber is mostly glazed, and that glazing will be upgraded. The timber linings and podium will be demounted in order to install insulation to the façade to achieve the external wall u value target of 0.3 W/m²K. This will therefore achieve the required U value to have no impact on the Part L and EUI targets for the building.

3.3.2 New Annexe

The new Annex is targeting fabric performance in line with the UKGBC and LETI guidance. Achieving these passive design fabric measures will ensure a reduction over Part L 2021 of the Building Regulations through energy efficiency alone. Good practice building fabric specification can significantly reduce the heating and cooling demands and loads of the building.

As well as the fabric performance, the building orientation and form has been developed to maximise passive design benefits.

The glazing ratio targeted is maximum 40% in order to achieve a balance between daylight and comfort. The open plan annex design allows for access to daylight from all sides. Continuity is provided around the façade with the glazing design and the large picture windows in the stage 3 design increase views and daylight on all orientations.

LETI or Low Energy Transformation Initiative (LETI) has published a series of important guidance on actions and targets to enable new developments achieve the carbon reduction targets set by the London Plan and local boroughs. There is no LETI guidance specifically for this project; however, we refer to that for offices for this project.

Table 3—3 New Annexe Fabric Performance

Element	Targeted value	Unit
Exposed and ground floors	0.10	W/m²K
Roof	0.11	W/m²K
External Wall	0.15	W/m²K
Windows (U-Value)	1.30	W/m²K
Windows (G-Value)	0.29	
Air permeability	3.0	m³/hr/m² @50Pa
Thermal bridging	Y=0.04	

3.4 MEP System design

3.4.1 Ventilation

Both buildings are too deep plan for single sided ventilation and the existing building has high glazing ratios. Noise from traffic using the adjacent road could also restrict the use of natural ventilation. This means that comfort associated with noise, air quality and air temperature would be compromised at times. The proposal is therefore to provide opening windows within the Civic Centre and New Annex alongside a mechanical ventilation system. Refer to the architects' proposed elevations for details of window openings. Opening windows will allow end users direct access to outside air when conditions are suitable and will reduce the use and energy consumption of the mechanical ventilation system..

Centralised Air Handling Units have been proposed as the ventilation solution for all office type areas, with Fan Coil Units to provide additional cooling when required. The diagram below shows a typical schematic overview of the system.

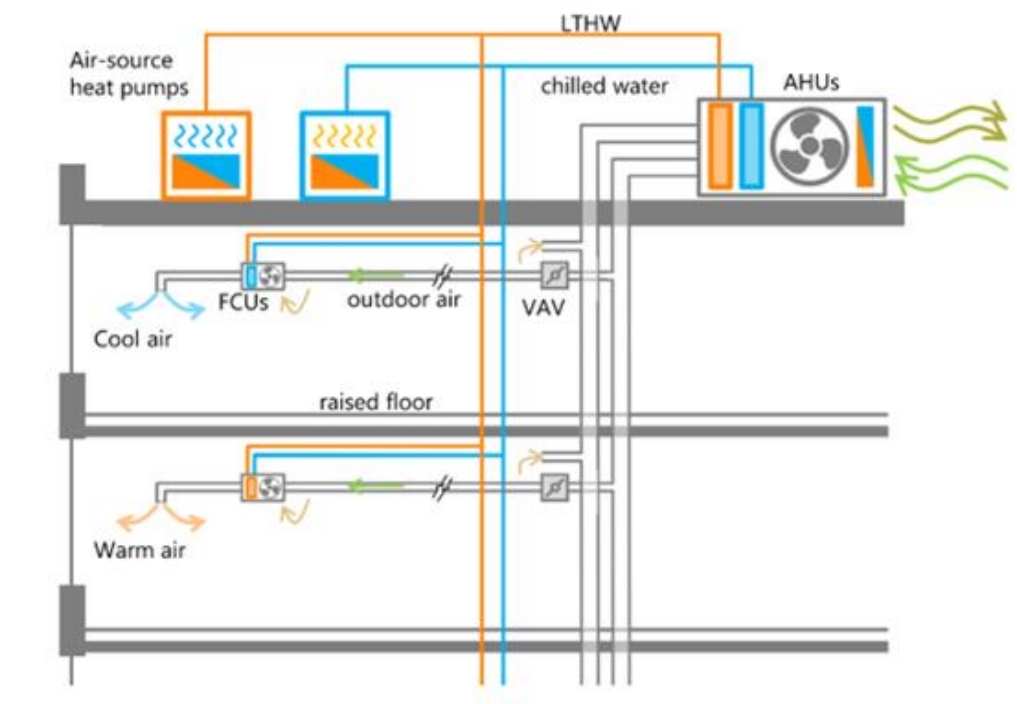


Figure 3—3 FCU system layout with fresh air supply

The ventilation strategies for each area have been further developed considering several factors including heritage constraints, spatial co-ordination, architectural aspirations, stakeholder feedback, operational energy and carbon emissions.

The heritage value of the existing building has been a continued theme which informs the design. An example of this is within the existing building we have proposed higher specific fan powers (SPW) in order to reduce size of ductwork distribution and Air Handling Unit configuration.

3.4.2 Heating

Trench heaters will provided in the open plan office areas, and larger meeting rooms. Radiators will be used to provide heating to the link block meeting rooms as well as Back of House areas. Heat pumps are generating the heat feeding into these systems.

3.4.2.1 Building Management System

The BMS control system shall integrate all Mechanical, Electrical and Public health components through a single platform providing control, visibility, reporting and continuous tuning of these systems.

Detailed and specific control routines will be provided for each plant and equipment. The conservation of energy and carbon, end user satisfaction, planned and reactive maintenance will all be considered within each operation.

BMS graphics will be provided and follow the same layout and form as the schematics for intuitive cross referencing for the Facilities Management team.

3.4.3 Domestic Hot water

Domestic hot water will be generated by a water source heat pump upgrading heat from the air source heat pump heating system to serve showers on the ground floor. Electric point of use water heaters will generate domestic hot water use in toilet and tea point areas

3.4.4 System efficiency

The system efficiencies of the building are informed by LETI guidance for commercial offices.

System	Civic Centre Efficiency	Annexe Efficiency
Centralised AHUs SFP	1.60 W/l/s	1.30 W/l/s
Toilet Ventilation MVHR units SFP	1.60 W/l/s	1.30 W/l/s
Heat recovery efficiency	80%	80%
Fan Coil Unit Efficiency	0.20 W/l/s	0.20 W/l/s
Heat pump/chiller cooling Efficiency – SEERs	4.34	4.34
Heat Pump heating Efficiency – SCOPs	3.50	4.00

The heat pump efficiency of the Civic Centre is less than the LETI target as the heritage constraints on replacing heat emitters require higher water temperatures that use more electricity to generate.

3.5 District energy networks

The site is in proximity to the new Wood Green District energy network. However, this is not due to be available for the start of the building's operation and therefore stand alone heat pump heating systems have been proposed.

Future connectivity to the London Borough of Haringey district heating systems has been facilitated through a space allocation for a plate heat exchanger and allocation for additional distribution pump sets, and a route for district heating pipes to enter the plantroom.

3.6 Electric efficiency

The lighting efficiencies and lux levels entered in the IES VE energy models for Part L and Operational Energy are as given in the table below. Efficient LED lighting will be installed throughout.

Table 3—4 Lighting efficiencies for energy models

Building	Area	Area illuminance Lux	Luminaire efficacy	Controls
New Annex	Open plan offices	400	114	time clock absence, daylight dimming
	Meeting rooms	400	122	absence detection
	breakout area	200	97 / 114	presence
	circulation/ lobby/ corridors	200	112	time-clock, presence, daylight dimming in wing circ
	toilets	200	108	presence
	showers	200	108	presence
	staircases	150	147	time-clock, presence
	plant rooms	250	156	manual
Existing civic centre	Open plan offices	400	114	time clock absence, daylight dimming
	Meeting rooms	400	122	absence detection
	Reception desk	500	111	manual
	breakout area	200	114	presence
	circulation/ lobby/ corridors	200	112	time-clock, presence, daylight dimming in wing circ
	toilets	200	108	presence
	staircases	150	147	time-clock, presence
	plant rooms	250	156	manual
	Civic chamber	300	97	time clock absence, daylight dimming

3.7 Renewable energy

Following the LZC study at stage 2, Solar Photovoltaics were decided as the most appropriate renewable energy solution for this development.

In order to reduce CO₂ emissions as far as practically possible, the PV cells extent needs to be maximised. The PV extent must be sensitive to planning limits and conservation requirements. The design team has worked with the solar panel contractor to determine areas that are acceptable within these constraints; these areas are shown in Figure 3—4.

To align heritage and sustainability, all areas must be low profile to ensure reduced visibility from sensitive sight lines.

The Part L carbon analysis includes for the renewable benefit of all given areas below. The Stage 3+ and planning target was to achieve a kilowatt peak power of around 140kWp across the whole development. The layout and array areas and PV output calculated in accordance with Part L to achieve these targets can be found in Figure 3—4, Table 3—5 and Table 3—6.

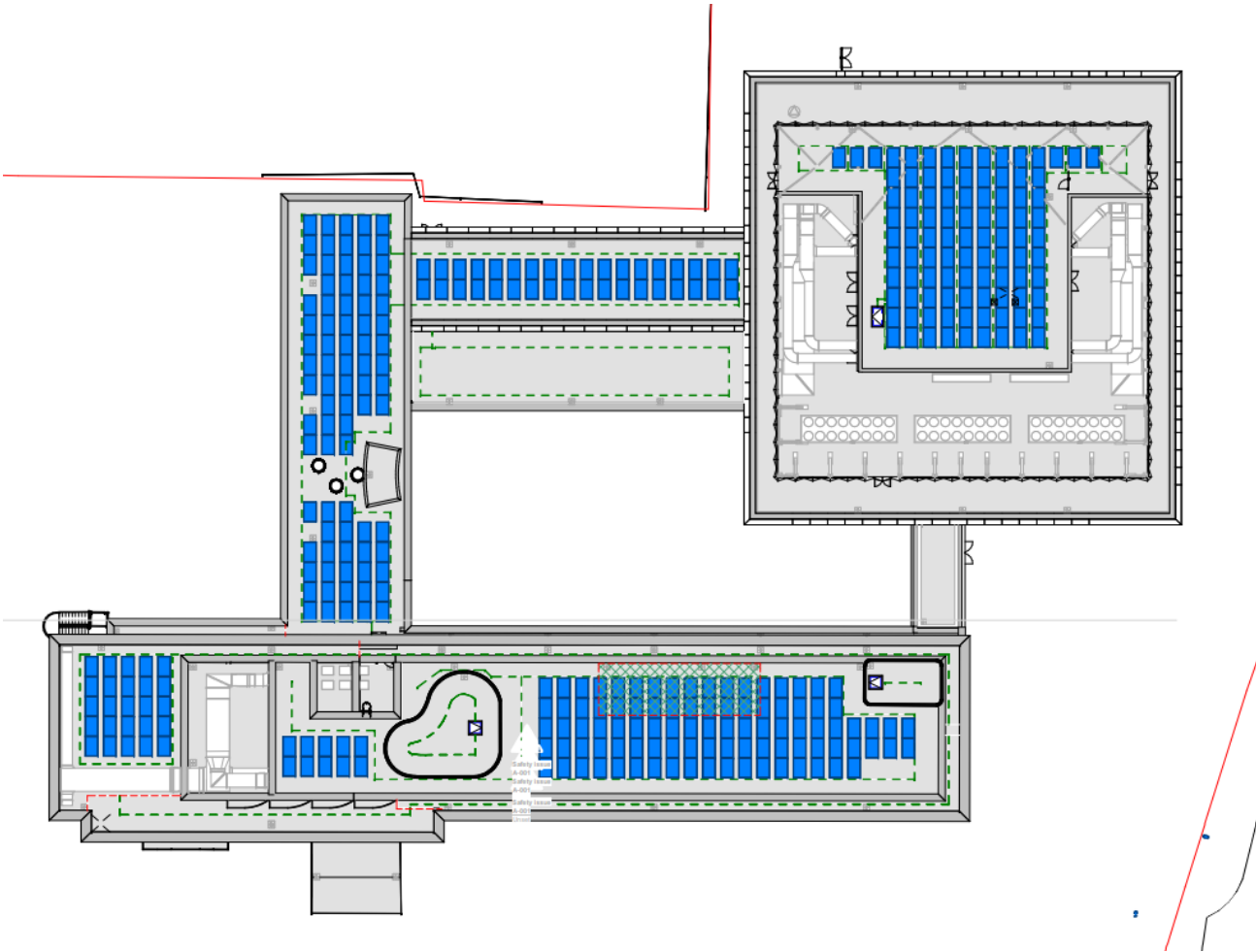


Figure 3—4 Architectural layout of Solar PV areas

Table 3—5 Stage 3+ PV details

Bauder roof area name and location	Orientation	Number of panels	Area of panels m²	Panel Tilt	Panel efficiency	Panel Wp	Array power kWp
Roof area 1 Upper: Existing Civic Centre north array	W	104	202	15 deg	21.3%	410	42.6
Roof area 1 Lower: Existing Civic Centre south array	S	25	49	15 deg	21.3%	410	10.3
Roof area 2: New Annex Main roof	S	96	186	15 deg	21.3%	410	39.4
Roof area 3: Existing Civic Centre Link roof	S	81	157	15 deg	21.3%	410	33.2
Roof area 4: New Annex Wing roof	W	36	70	15 deg	21.3%	410	14.8
Total Number of Panels	342						
Total Power required	140.2 kWp						

Table 3—6 Stage 3+ PV contribution

	Assessed floor area (m2)	Energy Production from PV (kWh/m2)	Energy Production from PV (kWh)
Existing Civic Centre	5,434.7	8.69	47,227.5
New Annex	4,835.7	16.07	77,709.7
Total			124,937.2

4 Part L results

The Building Regulations Part L governs the conservation of fuel and power in both new construction and refurbishment of the UK building stock. Compliance with Building Regulations is a regulatory requirement for all new developments, and carbon emissions of a development comparative to compliance with Part L is the key performance indicator for many carbon targets, including those set out in the London Plan.

The Haringey civic centre is a grade II listed building undergoing a major refurbishment connecting to a new building.

The relevant Part L document is ADL V2: Building Regulation Approved Document Part L Volume 2: Buildings other than dwellings.

The project has been measured against the current Part L (2021). In line with the New London Plan policy S12, a Lean, Clean and Green (and Seen) strategy has been developed to achieve an improvement over Part L (2021)

- **Be LEAN:** use less energy and manage demand during construction and operation.
- **Be CLEAN:** exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly.
- **Be GREEN:** generate, store and use renewable energy on-site.
- **Be SEEN:** monitor, verify and report on energy performance.

4.1 Energy Baseline Demand CO2 Emissions – ‘TER’

Baseline energy demands and associated CO₂ emissions have been estimated in line with the methodology set out in Section 4, following the GLA guidance for preparing energy statements. Part L compliance modelling has been carried out to assess the Proposed Development geometry using notional fabric and building services specification as stipulated in the National Calculation Methodology (2022).

4.1.1 Baseline Demand and CO2 Emissions

Baseline energy demands have been estimated in line with the GLA. For commercial areas, a thermal model using IES 2022 (ApacheSIM) has been created based on actual design geometry and systems following the NCM (2021) specifications.

The separate calculations have been generated using indicative service specifications and the following guidance documents: BCO 2022, CIBSE Guide A: Environmental Design 2015 and 2013 Non-Domestic Building Services Compliance Guide. These were used in order to produce an estimate of the non-domestic energy demands and CO₂ emissions. Baseline energy demands and carbon emissions use Notional building parameters as outlined in Part L2 (non-domestic) 2021.

4.1.2 Part L2A Regulated Emissions

The Proposed Development contains all non-domestic spaces including office, meeting rooms, civic chambers, communal corridors, circulation spaces, plantrooms, and amenity space ancillary to the office use.

4.1.3 Unregulated emissions

Non-domestic unregulated emissions and energy consumption have been estimated using the assumptions for equipment use provided in the NCM activity templates. These demands are assumed to be provided by grid electricity in all instances, with the relevant carbon factor applied to calculate associated carbon emissions.

For non-domestic buildings, the estimates are based on floor area and are therefore assumed not to change between each stage of the energy hierarchy.

4.1.4 Baseline predicted energy demand

The Baseline Target / Building Emission Rate (TER / BER) is modelled as a reference Building Regulations ‘compliant’ building. Given the nature of the project which includes a major refurbishment of an existing building and a new building extension, two separate Baseline buildings were modelled. One is utilised as a baseline for the existing Haringey civic centre, while the other is utilised as a baseline for the New Annexe extension. Both buildings have the following features:

- Notional fabric and glazing specifications
- Heat generation via:
 - ASHP

The baseline buildings are developed in two differing ways given that the development consists of the refurbishment of an existing building as well as a new building extension. For the new building extension, the baseline building is simply based on the notional specifications for new buildings according to Approved Document L2 2021. The baseline for the existing Civic Centre is instead based on specifications for existing buildings as described in the GLA Energy Assessment Guidance (2022).

In accordance with the GLA guidance, the baseline notional building for the existing Civic Centre was based on Table 11 in Appendix 3. Table 11 describes the notional specification that is to be applied for existing buildings to utilise a consistent baseline across refurbishment planning applications. It also references efficiencies for systems and specific fan power that are based on Approved Document Part L Volume 2 for existing buildings. The following describes the differences in specifications between the ‘Baseline’ Civic Centre building and the ‘Lean’ Civic Centre building.

Table 4—1 Specifications comparison between the Baseline and Lean buildings of the existing Civic Centre

Parameter	Civic Centre - Baseline	Civic Centre – Lean
Systems		
Centralised AHUs SFP	2.60 W/l/s	1.60 W/l/s
Toilet Ventilation MVHR units SFP	2.60 W/l/s	1.60 W/l/s
Heat recovery efficiency	70%	80%
Fan Coil Unit Efficiency	0.40 W/l/s	0.20 W/l/s
Chiller Efficiency – SEERs	4.50	4.34
Heat Pump Efficiency – SCOPs	2.64	2.64
Heat Pump Efficiency – SCOPs (DHW)	2.86	2.86
Lighting	60 Lm/Watt	Varies (Refer to Table 3-4)
Building Envelope		
Wall – cavity insulated	0.55 W/m²K	0.30 W/m²K
Wall – external or internal insulation	0.30 W/m²K	0.30 W/m²K
Flat Roof	0.18 W/m²K	0.18 W/m²K
Floors	0.25 W/m²K	0.25 W/m²K
Glazing	1.40 W/m²K	1.80 W/m²K
G-value	0.40 W/m²K	0.40 W/m²K
Air permeability	25 m³/hr/m² @50Pa	5 m³/hr/m² @50Pa

The following Tables describe the predicted energy and carbon demands for the Civic Centre and New Annexe baseline buildings.

Table 4—2 Predicted ‘Baseline’ energy demands

Typology	Baseline energy demand (kWh/m ² /year)						
	Space Heating	Cooling	Auxiliary	Lighting	Hot Water	PV Generation	Total
Civic Centre	12.58	7.57	15.83	19.38	2.71	0.00	58.07
New Annexe	1.87	5.54	8.91	13.10	5.04	0.00	34.46

4.1.5 Baseline’ carbon emissions

Table 4—3 Predicted ‘Baseline’ carbon emissions (SAP 10.2 carbon factors)

Typology	Baseline Regulated Carbon Emissions	
	Tonnes CO ₂ /year	
	Civic Centre	New Annexe
Total	44.18	22.29

4.2 Energy Demand Reduction – ‘Lean’

This section outlines the strategic demand reduction and energy efficiency measures integrated in the Proposed Development and their impacts on energy demand and carbon reductions. The values provided are indicative fabric and services specifications which will be reviewed throughout the design process to ensure compliance with Part L and DfP recommendations.

4.2.1 Passive Design

Passive design measures will be incorporated into the detailed design of the Proposed Development to aim for a 15% reduction over Part L2 2021 (non-domestic) of the Building Regulations.

Passive design aims to investigate ways to reduce the energy use of the project through passive means, such as improved orientation, massing, building fabric performance, daylight, and ventilation; many of which are limited with neighbouring properties on the Site.

Improvement to fabric performance, efficient lighting and design, and building services parameters were applied as stated in Section 3 of this report. The only change is that the ASHP SCOP applied to the Lean Buildings was adjusted to match the SCOP of the notional building as specified in the 2021 NCM Modelling Guide. This meant a SCOP of 2.64 and 2.86 for space heating and water heating respectively.

4.2.2 ‘Lean’ NCM Energy Demand

The Lean calculations demonstrate an improved model from energy efficient measures and optimum envelope compared to Baseline, with the following features:

- Improved glazing percentage, building fabric and air tightness over Notional.
- Energy efficiency measures required to achieve 15% reduction on non-Domestic as per Part L 2021 compliance.
- Highly energy efficient lighting fittings and controls.

The following Tables describe the predicted energy and carbon demands for the Lean buildings.

Table 4—4 Predicted ‘Lean’ energy demands

Typology	Lean energy demand (kWh/m ² /year)						
	Space Heating	Cooling	Auxiliary	Lighting	Hot Water	PV Generation	Total
Civic Centre	10.74	5.06	11.44	10.2	2.71	0.00	40.14
New Annexe	2.61	5.19	7.44	10.02	5.79	0.00	31.06

4.2.3 ‘Lean’ Carbon Emissions

Table 4—5 Predicted ‘Lean’ carbon emissions (SAP 10.2 carbon factors)

Typology	Baseline Regulated Carbon Emissions	Lean Regulated Carbon Emissions	
	Tonnes CO ₂ /year	Tonnes CO ₂ /year	% Improvement over Baseline
Civic Centre	44.18	30.71	31%
New Annexe	22.29	20.16	10%
Site-Wide	66.48	50.87	23%

4.3 Air Source Heat Pump Improvement – ‘Clean’

The GLA promotes that once the demand for energy has been minimised, all planning applications must demonstrate how their energy systems will exploit local energy sources (such as secondary heat) and supply energy efficiently and cleanly to reduce carbon emissions, by following the heating hierarchy in London Plan Policy SI 3.

To improve the energy systems in use in the development, the system efficiencies of the building are informed by LETI guidance for commercial offices. This resulted in the specification of heat pumps that have higher efficiencies than those in use in the ‘Lean’ stage. A breakdown of system specifications is documented in Section 3.4.4.

4.3.1 ‘Clean’ NCM Energy Demand

The Clean calculations demonstrate a more efficient model from the improvement of energy systems in the development compared to the ‘Lean’ stage. The following tables describe the predicted energy and carbon demands for the Clean buildings:

- Highly efficient heat pumps.

The following Tables describe the predicted energy and carbon demands for the Clean buildings.

Table 4—6 Predicted ‘Clean’ energy demands

Typology	Clean energy demand (kWh/m ² /year)						
	Space Heating	Cooling	Auxiliary	Lighting	Hot Water	PV Generation	Total
Civic Centre	8.10	5.06	11.44	10.20	2.55	0.00	37.35
New Annexe	1.73	5.19	7.44	10.02	4.82	0.00	29.20

4.3.2 ‘Clean’ Carbon Emissions

The use of heat pumps with higher efficiencies further improved the performance of both the Civic Centre and New Annexe buildings compared to the ‘Lean’ Stage.

Table 4—7 Predicted ‘Clean’ carbon emissions (SAP 10.2 carbon factors)

Typology	Baseline Regulated Carbon Emissions	Clean Regulated Carbon Emissions	
	Tonnes CO ₂ /year	Tonnes CO ₂ /year	% Improvement over Baseline
Civic Centre	44.18	28.37	36%
New Annexe	22.29	18.86	15%
Site-Wide	66.48	47.23	28%

4.4 Energy Renewable Energy – ‘Green’

An assessment of the project context relating to LZC technologies has been made, including the drivers for installing LZC technologies, the Site opportunities and constraints, the estimated energy demands of the scheme and the potential for any financial support. The following aspects were addressed:

- Energy generated and CO₂ savings
- Life cycle costs and payback including grants and incentives
- Space and land use requirements
- Local planning requirements, including noise
- Potential to export energy from the system
- Potential for energy storage

The table below presents the findings of the feasibility analysis for the suitable LZC technology options for the project. The conclusions of this analysis are as follows:

- Air Source Heat Pumps (ASHP) is considered as the most viable solution for satisfying the space heating and hot water demand of the building, considering the grid will decarbonise in years to come. They can also recover waste heat from cooling circuits for covering additional loads in the building, significantly increasing the system efficiency
- Solar PV is also considered as a viable method of generating renewable electricity and reducing the carbon emissions considering the effectiveness and space availability
- Ground Source Heat Pump (GSHP) system is found unsuitable solution due to long payback periods, space constraints and high capital costs implied
- Solar thermal technology is found unsuitable solution due to imparity on demand versus efficiencies, long payback periods, space constraints and high capital costs
- Small scale turbines (horizontal or vertical axis) were considered unsuitable for the Site due to the space requirements, noise impact, high capital cost and long payback compared to the total energy savings estimations.

Table 4—8 Haringey Civic Centre LZC feasibility

Option	Suitability for Scheme	Viability
 Air Source Heat pumps	The European directive recognises air source heat pumps as a renewable energy source. In a similar way to the ground sourced technologies, the air is used to provide thermal energy. Recent technological developments have increased capacity and efficiency of ASHPs. Air source heat pumps should be located externally, and location should consider ambient noise emissions. As described in section 3, air source heat pumps are proposed to supply space and water heating aiming for a low carbon option that will achieve minimised carbon emissions and improved system efficiency. It is proven then to be highly effective to deliver high CO ₂ savings and thus considered as a viable solution.	
 Ground Source Heat pumps	There are a number of ways in which the ground can be used: horizontal pipes in the ground; vertical boreholes and putting the pipe work in piles. In all cases, the system is closed, and the working fluid is pumped around. Open loop systems tend to use an aquifer deep underground to act as a heat sink; this technology is not widely used in the UK which may pose an element of risk. In the southeast of England, the ground make-up is such that clay is typically found in the tens of metres under the surface; unfortunately, clay does not allow for the dissipation of heat effectively as it does not allow the free movement of water. Even though this technology could provide significant carbon savings; it is subject to ground conditions and heat balances. Further ground investigations are needed, and it is suggested that this option could be considered during post-planning stages.	
 Solar PV	Electrical generation using solar photovoltaic panels is a typical, cost-effective solution for high density urban development. A PV array, even limited, will benefit the scheme for uplifting the energy savings from renewables.	
 Solar Thermal	Solar thermal panels can be used to provide domestic hot water, as by exploiting the absorbed sun energy can preheat the water stored up in a cylinder. These systems are efficient during summer months, where the hot water demand of the scheme is not proven to be significant. In addition, solar thermal systems have a long payback and high capital cost. It is therefore not a viable option for the current scheme and instead PV panels can be mounted in the available to reduce further the electrical load.	
 Biomass	Biomass boilers are not suitable for this project due to the risk of producing harmful levels of nitrogen dioxide and particulate matter in close proximity to a densely populated area.	
 Wind	Wind turbines harness the kinetic energy in the wind and convert this to electrical energy using a mechanical turbine. The efficacy of wind turbines depends heavily on (i) the wind speed and (ii) the swept area of the turbine's blades. In an urban environment such as the area of 38-70 Baker Street Scheme, wind characteristics are generally turbulent owing to the surrounding buildings obstructing its path at low level. Its installation within the Proposed Development would have significant impacts on the amenity of surrounding residents. There is also not enough roof space to make this viable and there are other limitations on the building's profile.	
 Water Technologies	The Site is not located in close proximity to a watercourse. Electricity generation technologies such as small-scale hydropower, tidal power or wave power would not be appropriate as the infrastructure required would have a high capital cost and long payback in addition to the risk of interference with river traffic or local ecosystems.	

 Viable  To be further assessed  Unsuitable

4.4.1 ‘Green’ predicted energy demand

The Green calculations demonstrate an improved model from renewable energy measures, with the following features:

- Solar PV panels

The photovoltaic system specifications utilised in this development is described in Section 3.7. The following tables describe the predicted energy and carbon demands for the Green buildings.

Table 4—9 Predicted ‘Green’ energy demands

Typology	Green energy demand (kWh/m ² /year)						
	Space Heating	Cooling	Auxiliary	Lighting	Hot Water	PV Generation	Total
Civic Centre	8.10	5.06	11.44	10.20	2.55	-8.69	28.66
New Annexe	1.73	5.19	7.44	10.02	4.82	-16.07	13.13

4.4.2 ‘Green’ Carbon Emissions

The use of high efficiency PV panels significantly improves the performance of the development.

Table 4—10 Predicted ‘Green’ carbon emissions (SAP 10.2 carbon factors)

Typology	Baseline Regulated Carbon Emissions	Green Regulated Carbon Emissions	
	Tonnes CO ₂ /year	Tonnes CO ₂ /year	% Improvement over Baseline
Civic Centre	44.18	22.34	49%
New Annexe	22.29	8.99	60%
Site-Wide	66.48	31.33	53%

4.4.3 Energy Hierarchy Summary

The Lean, Clean, and Green (as outlined by the London Plan) modelling results have been collated in the format required for the planning submission as outlined in the GLA’s Energy Assessment Guidance (2022). The following Figure and Table outline the carbon emissions of the development using the SAP 10.2 emissions factors and Part L 2021. They are presented for the entire site, and individually for the Existing Civic Centre and New Annexe building extension.

Site-wide Part L 2021 Performance:

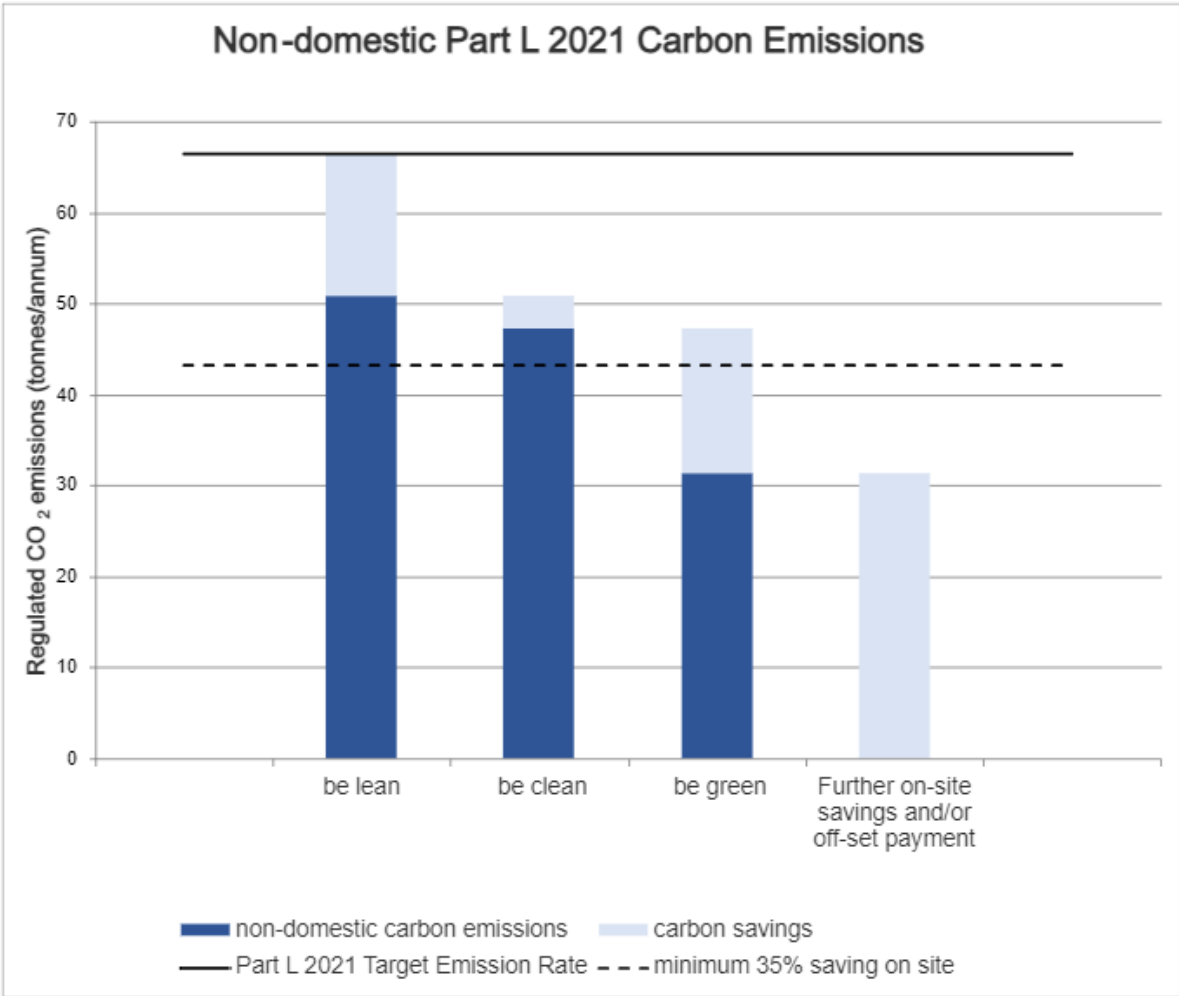


Figure 4—1 Haringey Civic Centre Site-Wide Carbon Savings throughout the energy hierarchy (Part L 2021)

Table 4—11 Site-Wide predicted regulated CO₂ emissions and savings at each Energy Hierarchy stage (Part L 2021)

Part L 2021	Total regulated emissions (Tonnes CO ₂ /year)	CO ₂ savings (Tonnes CO ₂ /year)	Percentage saving (%)
Part L 2021 Baseline	66.5		
Be Lean: savings from energy demand reduction	50.9	15.6	23%
Be Clean: savings from heat network	47.2	3.6	5%
Be Green: savings from renewable energy	31.3	15.9	24%
Cumulative on-site savings		35.1	53%
		CO ₂ savings off-set (Tonnes CO ₂)	CO ₂ off-set payment (£)
Total Site Wide Off Set		940	98,223

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide plus 10%.

Existing Civic Centre Part L 2021 Performance:

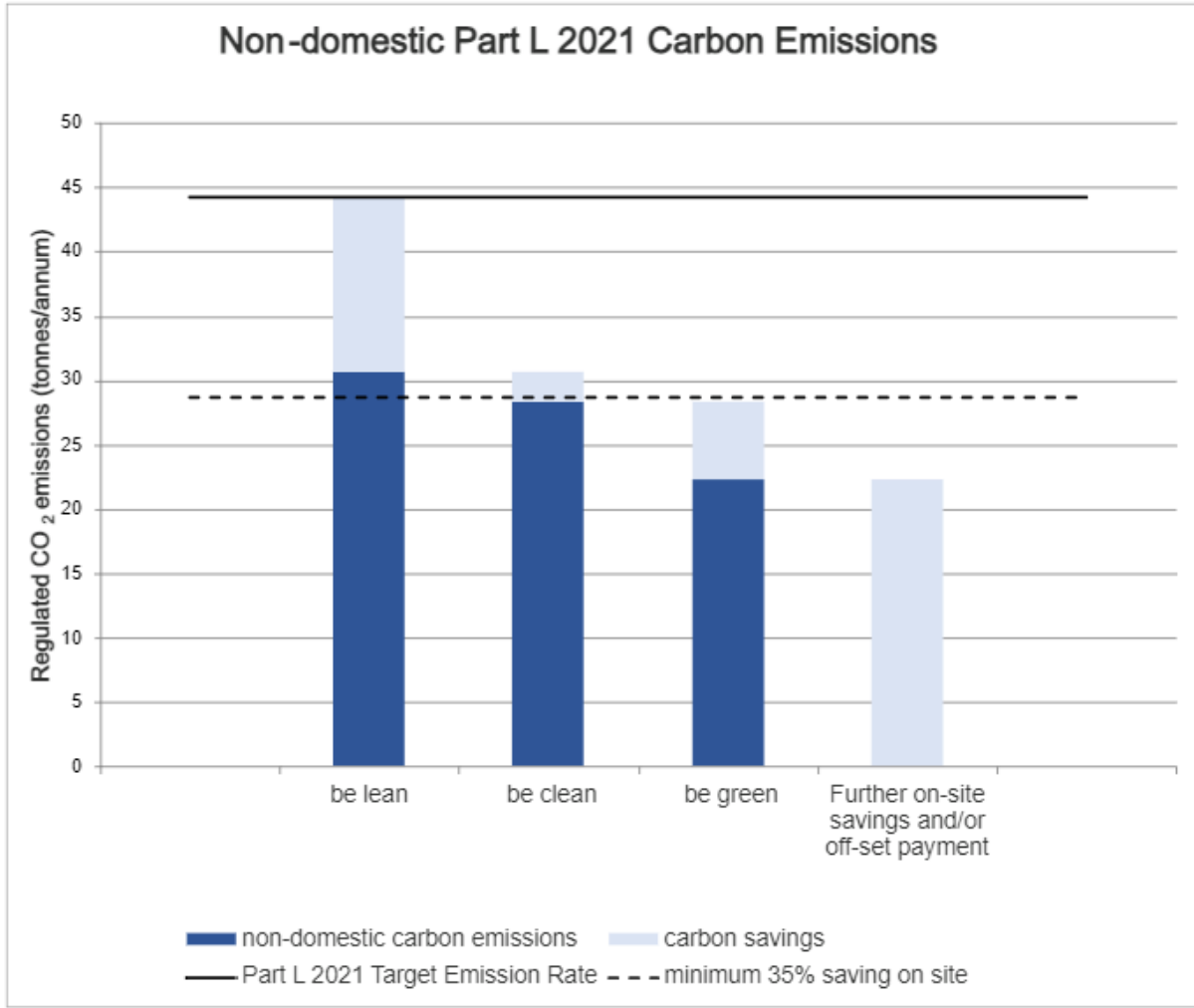


Figure 4—2 Existing Civic Centre Carbon Savings throughout the energy hierarchy (Part L 2021)

Table 4—12 Existing Civic Centre predicted regulated CO₂ emissions and savings at each Energy Hierarchy stage (Part L 2021)

Part L 2021	Total regulated emissions (Tonnes CO ₂ /year)	CO ₂ savings (Tonnes CO ₂ /year)	Percentage saving (%)
Part L 2021 Baseline	44.2		
Be Lean: savings from energy demand reduction	30.7	13.5	31%
Be Clean: savings from heat network	28.4	2.3	5%
Be Green: savings from renewable energy	22.3	6.0	14%
Cumulative on-site savings		21.8	49%
		CO ₂ savings off-set (Tonnes CO ₂)	
Civic Centre Off Set		670	

New Annexe Part L 2021 Performance:

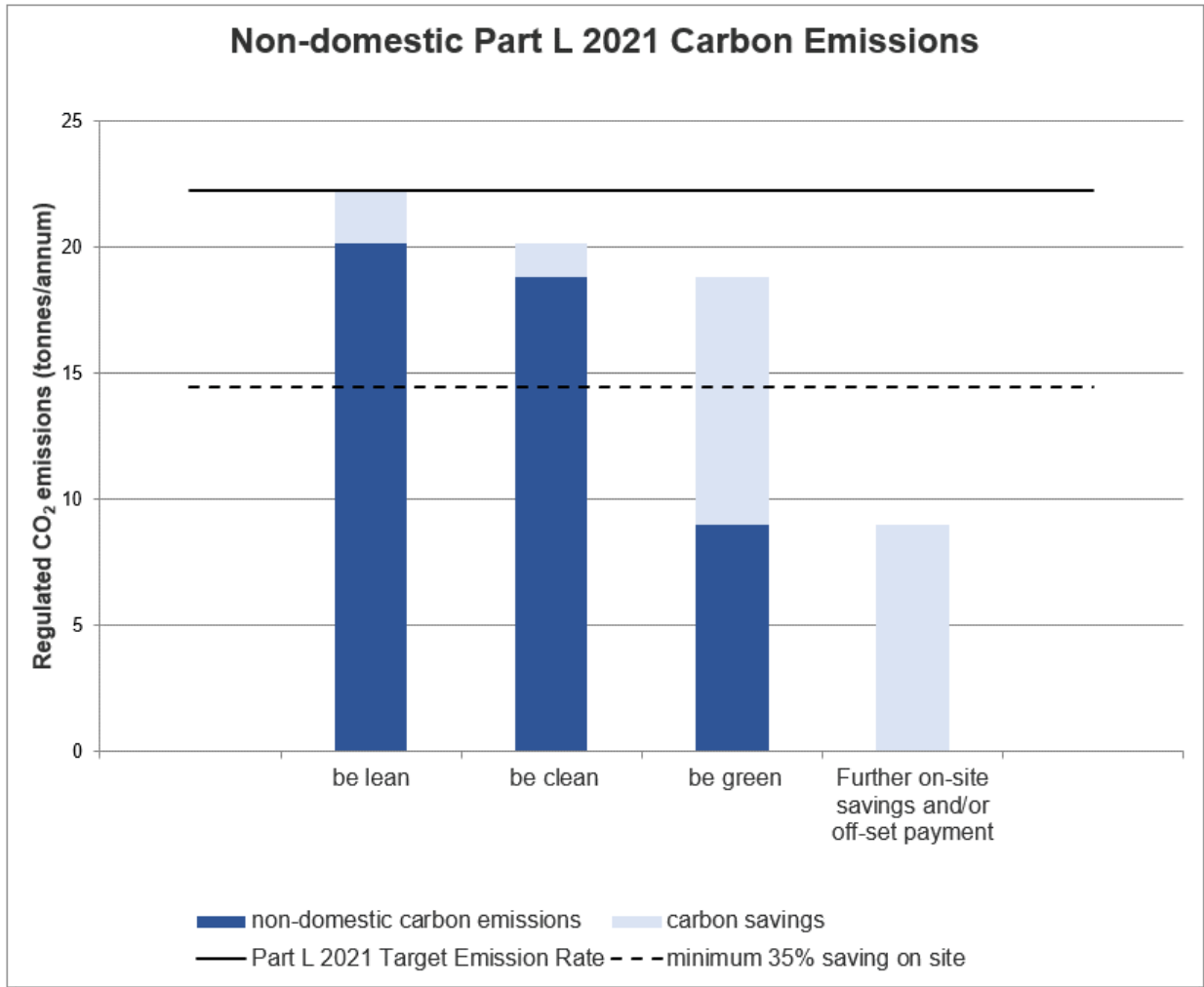


Figure 4—3 New Annexe Carbon Savings throughout the energy hierarchy (Part L 2021)

Table 4—13 New Annexe predicted regulated CO₂ emissions and savings at each Energy Hierarchy stage (Part L 2021)

Part L 2021	Total regulated emissions (Tonnes CO ₂ /year)	CO ₂ savings (Tonnes CO ₂ /year)	Percentage saving (%)
Part L 2021 Baseline	22.3		
Be Lean: savings from energy demand reduction	20.2	2.1	10%
Be Clean: savings from heat network	18.9	1.3	6%
Be Green: savings from renewable energy	9.0	9.9	44%
Cumulative on-site savings		13.3	60%
		CO ₂ savings off-set (Tonnes CO ₂)	
New Annexe Off Set		270	

4.5 Ventilation and Thermal overheating mitigation and the GLA Cooling Hierarchy

The Greater London authority GLA Guidance on Preparing Energy Assessments (June 2022) requires that major development proposals should reduce potential overheating and reliance on air-conditioning systems and demonstrate this in accordance with the cooling hierarchy outlined as follows:

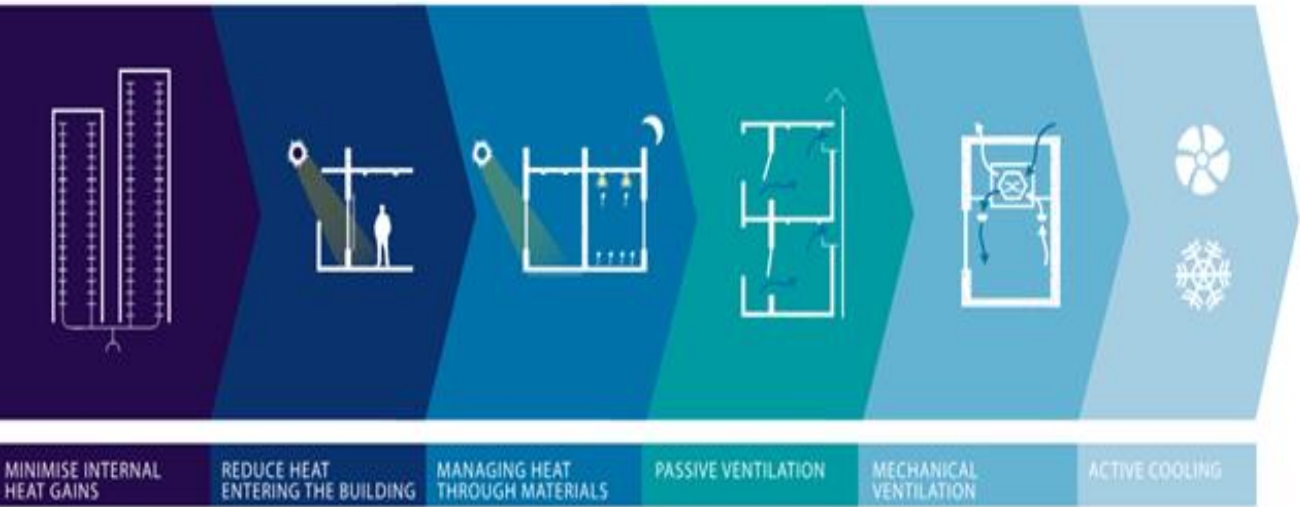


Figure 4-4 GLA Cooling Hierarchy

A separate thermal comfort report has been produced to detail how the design complies with the GLA Cooling Hierarchy, a summary of which is in Table 4-14.

Table 4-14 Cooling hierarchy, mitigation measures based on GLA guidance

London Plan: Policy 5.9–Cooling hierarchy	Haringey Civic Centre Strategies
1. Reduce the amount of heat entering a building in summer through passives measures including balconies, louvres, internal or external blinds, shutters, trees, and vegetation.	- Reduce the window to wall ratio WWR to below 40% as recommended by LETI guidance. - External shading elements have been included into the design of the façade. This includes vertical fins and overhangs around the glazing in the development. This contributes to the reduction of solar heat gains during the summer.
2. Minimise internal heat generation through energy efficient design.	- Using LED lighting and minimise the impact using daylighting and occupancy sensors. - Separation of areas to use different small power allowance for office using (BCO) guidance.
3. Manage the heat within the building through exposed internal thermal mass and high ceilings.	The New Annexe building utilises exposed ceilings which absorb internal heat gains during the day and released at night in conjunction with either secure opening windows or mechanical ventilation.
4. Passive ventilation using openable windows, shallow floorplates, dual aspect units designing in the ‘stack effect’.	There are openable windows in both the Civic Centre and New Annexe extension. This provides the opportunity to utilise a mixed mode ventilation strategy.
5. Mechanical ventilation can be used to make use of ‘free cooling’ where the outside temperature is below that in the building during summer months	Highly efficient mechanical ventilation with heat recovery is proposed for fresh air supply when required that can provide free cooling when external temperatures are below the cooling room setpoint.
6. Active cooling systems	All previous measures contribute to reduce the peak cooling demand and decrease the size of fan coil units for thermal comfort as well as using efficient heat pumps.

These measures have resulting in a reduction in cooling demand for the building when compared with the notional building and is summarised in Table 4—15.

Table 4—15 Cooling demand

	Area weighted cooling demand (MJ/m²)	Total cooling demand (MJ/year)
Civic Centre Actual	93.8	305,807
Civic Centre Notional	134.9	439,662
New Annexe Actual	82.1	296,669
New Annexe Notional	123.7	446,846
Site-Wide Actual	87.7	602,476
Site-Wide Notional	129	886,508

5 Operational Energy calculations

5.1 Overview

Buro Happold has carried out a prediction of operational energy consumption using advance simulation modelling in accordance with CIBSE TM54 requirements for the Haringey Civic Centre buildings located at 255 High Rd, London N22 8LE. This also follows the GLA Be Seen requirement of reporting on EUI.

Both buildings are fully electric and fossil fuel free. The targets that Haringey Civic Centre is seeking to achieve are an EUI of 90kWh/m² in the annexe building and 225kWh/m² in the existing civic centre when refurbished.

5.1.1 The energy consumption estimate

The findings of the operational energy modelling show a predicted Net EUI of 89-115kWh/m² for the annexe building and 148-188 kWh/m² for the existing Civic Centre. The lower value reflects the output from the model whilst the upper value includes a 25% allowance for non-ideal operation of the building during occupancy.

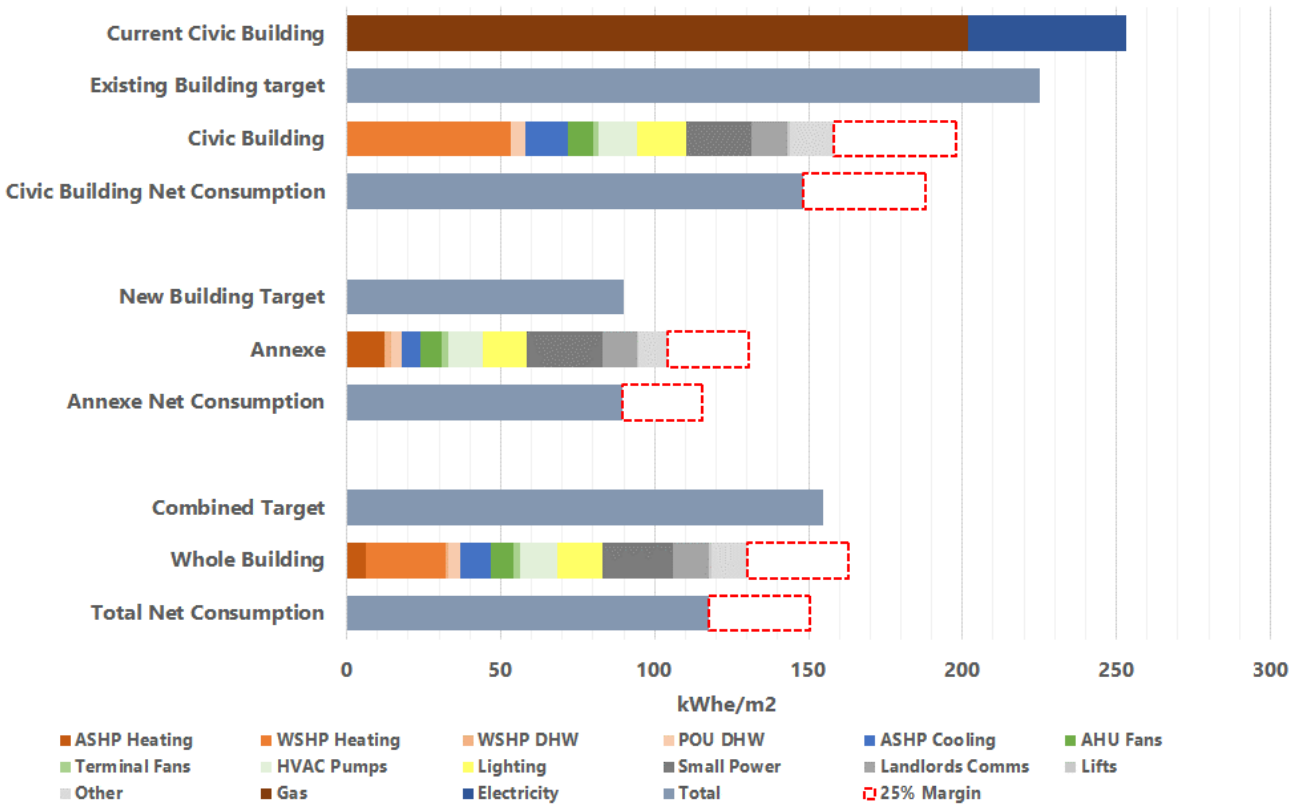


Figure 5—1 Estimated Annual Energy Consumption

5.1.2 The Assumptions

Key assumptions associated with the outcome of this work are:

- Energy consumption associated with small power and comms room equipment were the largest consumers of energy. A diversified small power load of around 11W/m² has been assumed based on typical office use. Small power usage will be key to achieving the energy targets in operation
- Seasonal efficiencies of central plant have been assumed at this stage. Plant efficiency curves will be integrated to allow fine tuning of the design during RIBA Stage 4

- Pump energy consumption has been estimated based on typical building performance. This will be developed in more detail as the design develops in RIBA Stage 4
- Zoning of the building so that only areas in use outside of the normal operating hours are supplied, and the ability of the central plant to turn down at low load will be critical in maintaining operational energy efficiency.
- The further development of description of controls operation in RIBA Stage 4, informed by the energy model, will allow the contractor to set up the building and building operator to operate the building efficiently.
- It should be noted that plant located in the Annexe does serve the Civic Building so it is expected that the Annexe may exceed the new building targets as a result of additional consumption associated with the ASHPs and water pumping.
- An additional lift may be added to the annex design, which would add an additional operational energy load. This is not currently in the Stage 3 design and therefore not included.

5.2 Introduction

The purpose of this section is to:

- Summarise what is included in the estimate and describe how each element was calculated
- Summarise the results of the estimate
- Demonstrate the estimate is a realistic representation of how the building will perform in operation

Design drawings and documents have been referenced, and information that can be found in these documents have not been repeated in this report. This report describes where interpretation, assumption or approximation of design information has been used in the estimate.

More detailed information for each element of the estimate is available on request.

The estimate was calculated using energy modelling software IES VE 2022.1.2.0 (Hotfix 2) and HVAC systems were modelled in detail using Apache Systems.

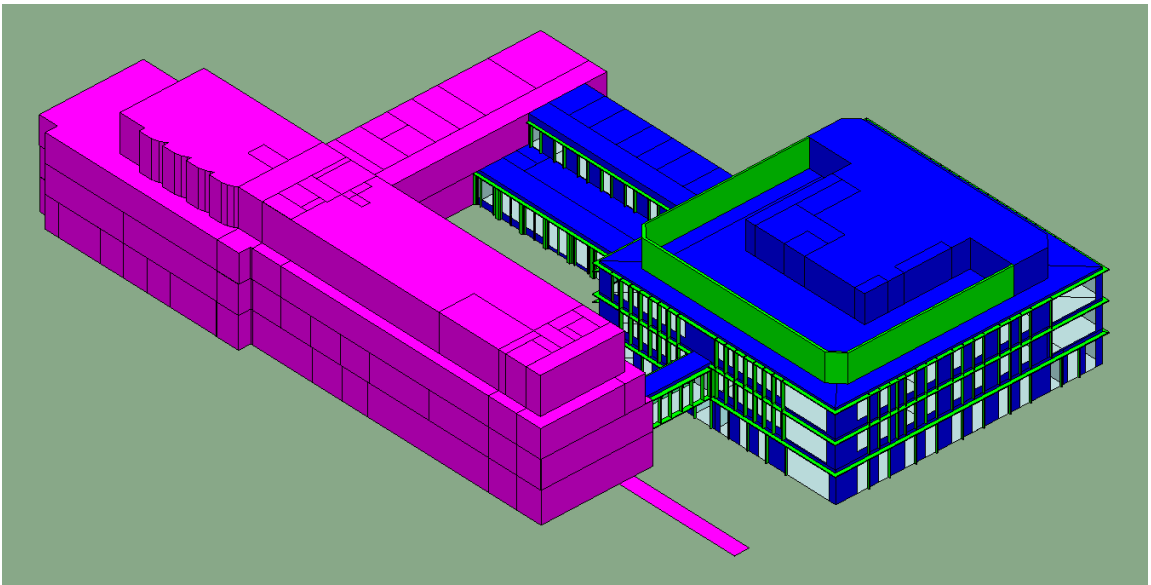


Figure 5—2 IES VE energy model site geometry – annex view

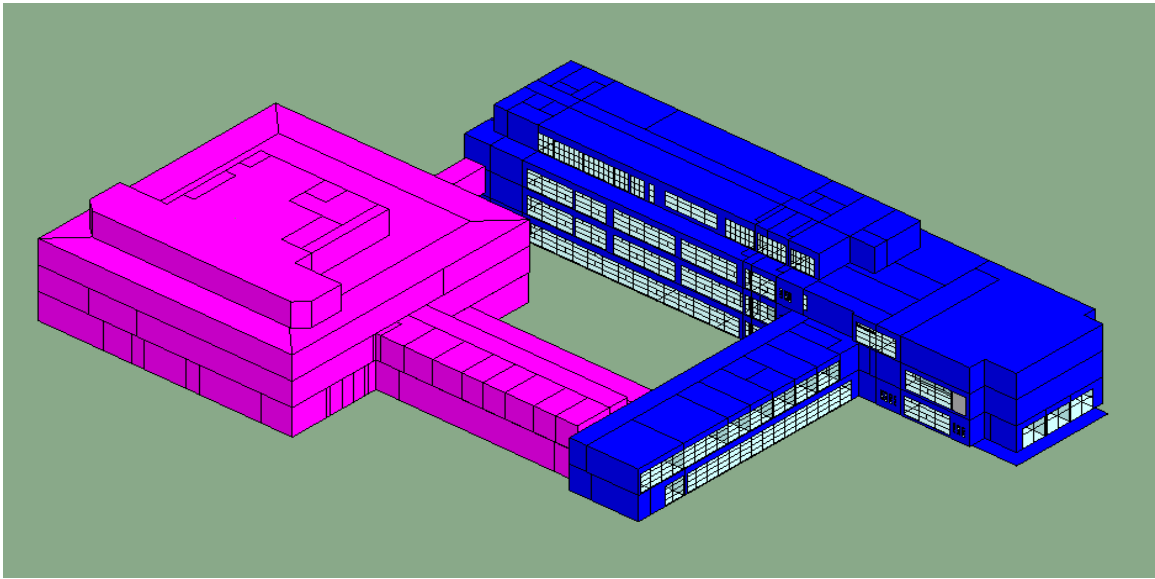


Figure 5—3 IES VE energy model site geometry – civic centre view

5.3 Input data and assumptions

Further detail on all inputs and assumptions can be found in Appendix D.

5.3.1 Estimating energy using a simulation

The energy consumption estimate for the building has been made using a simulation model for all major plant in conjunction with separate Excel spreadsheet calculations for elements that cannot be represented in the energy modelling package and for minor energy consuming elements. Supplementary calculations have been used for the following major elements:

- Lift energy consumption has been calculated independently of the model and has been based on latest manufacturer inputs.
- Hot water energy consumption for both the annexe and existing Civic Centre has been calculated independently based on the heating and storage systems and expected usage based on occupancy.
- Auxiliary fan power from FCU and MVHR units has been calculated independently according to proposed scheduling.

5.3.2 HVAC software simulation package and model

The dynamic energy simulation modelling software IES Virtual Environment, version 2022.1.2.0 has been used for this analysis to provide an hourly energy demand prediction for the building. The following software components have been utilised:

- **ModelIT** – defining the building geometry, its façade shading features, and the surrounding buildings
- **Apache** – defining the building fabric properties accounting for total U-value including thermal bridging, glazing properties including the total Solar Heat Gain Coefficient (SHGC), and internal gains
- **Suncast** – to model direct solar gain into the building through windows and rooflights accounting for shading from the building form and surroundings
- **MacroFlo** – for calculating bulk air flow between zones

The software has been validated through ANSI/ASHRAE Standard 140, Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs.

5.3.3 Climate data

CIBSE Test Reference Year (TRY) weather data for London has been used in the Stage 3 analysis. The TRY 2020 weather data represents the average month selected from 2010 – 2039.

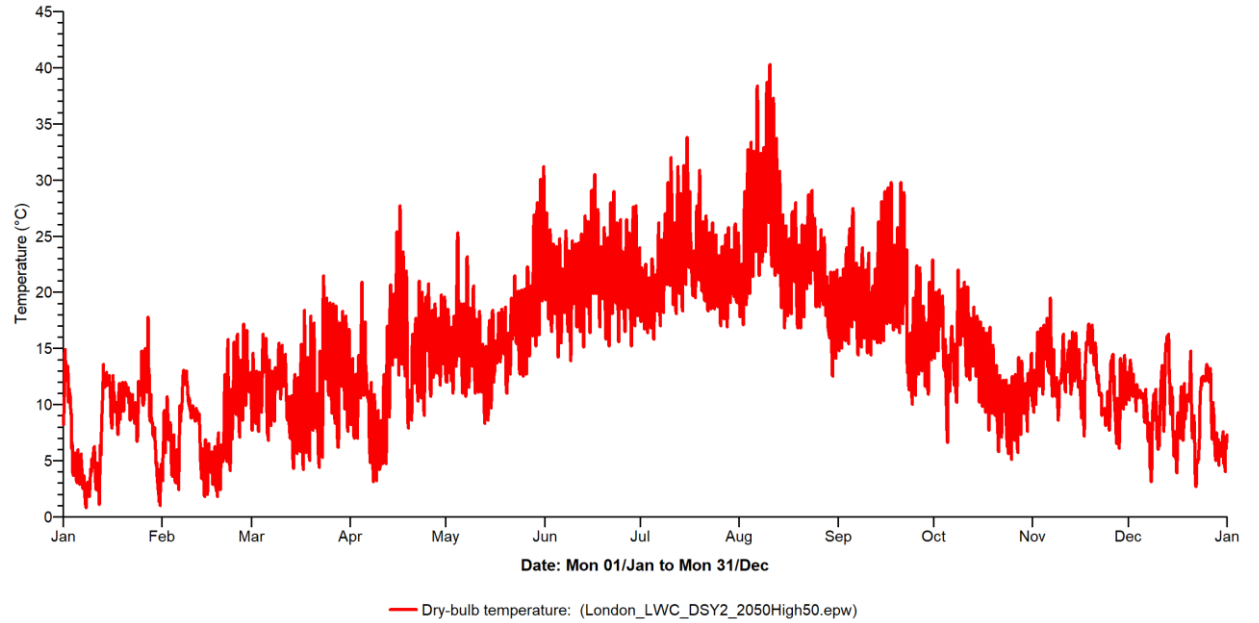


Figure 5—4 TRY 2020 weather files used in the baseline model

5.3.4 The building

The annexe consists of 4 storeys primarily containing open plan offices and meeting rooms with additional facilities such as showers for office staff. This building is connected via two walkways to the existing Civic Centre. The Civic Centre also contains large open plan offices as well as a welcome area for visitors to the large Civic Chamber. There is also a basement present containing the plant equipment for the Civic Centre. Appendix A references the architectural drawings forming the basis of the model and the office NIA calculation. A visual representation of the building model is shown in Figure 5—5 and shows the external shading features included in the following forms:

- Fins and window reveals are considered as part of the structure and have been incorporated as shading devices.
- Adjacent buildings have been incorporated as simplified geometric blocks
- Glazing modelled includes the frame with thermal properties assigned to glass and frame to represent the whole unit.
- Building façade U-values have been set based on the RIBA Stage 3 design.

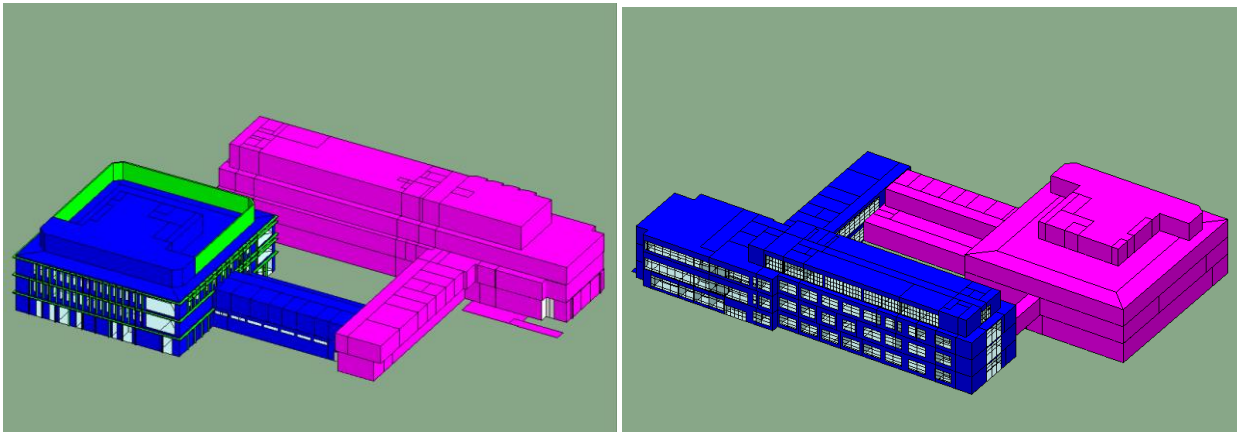


Figure 5—5 Energy model geometry – building

5.3.5 Internal gains

Thermal templates have been set up for the following space types and applied to all rooms within the building:

- Office space
- Reception
- Corridors
- Stairs
- Plant rooms

Internal heat gains have been modelled to follow the RFI schedules of occupancy and equipment present in each space.

5.3.5.1 Occupancy gains

For plant-sizing an occupancy density of 1 person per 8m² has been used for the offices and meeting spaces. Heat gains from occupants has assumed to have a sensible heat gain of 75W/person and latent heat gain of 55W/person.

5.3.5.2 Lighting

Average lighting power density for each space type was calculated from the RIBA Stage 3 lighting calculations and applied to the relevant templates as it will have impact of the cooling and heating demand.

The energy used by tenant office lighting has not been included in this estimate as it focuses only on base build energy.

5.3.5.3 Equipment

The MEP design uses 25W/m² for sizing of office cooling and electrical services. Office equipment was set at 25W/m² for 100% on the profile in the operational energy model with a 50% diversification factor.

A blanket equipment power density of 5W/m² has been applied to all WCs, circulation and stairs operating on the same profile as the office space. The energy use for this equipment has been included in the energy rating calculation to cover various pieces of electrical equipment throughout the building.

Other equipment power consumption and heat gains to specific plant and technical rooms have been applied are used to estimate the common landlord area power consumptions.

- FM room (5 W/m2 100% during occupancy 80% when unoccupied)

- LV Switchgear (5 W/m2, profile based on building electrical demand, no electrical consumption)
- HV Switchgear (5 W/m2, profile based on building electrical demand, no electrical consumption)
- COMMs (9kW, 100% during occupancy, 50% when unoccupied with 0.75 diversification)

5.3.6 Mechanical systems

The mechanical services model includes the following systems:

- The office heating and cooling has been modelled as a fan coil unit system and radiator network served by a central air source heat pump (ASHP) in the annexe building. This is boosted to a higher temperature by a water source heat pump to serve the existing Civic Centre.
- The fresh air ventilation system has been modelled in Apache as central air handling units matching the RIBA Stage 3 design information.
- Domestic hot water (DHW) for the showers is generated centrally via a water source heat pump utilising the LTHW system as a heat source.
- DHW for handwash basins in WCs is delivered using instantaneous electric hot water.

5.3.6.1 Domestic hot water

Domestic hot water (DHW) usage has been estimated based on:

- Handwashing and building cleaning based on 2l/person/day using the office occupancy profile
- Building cleaning based on 175 litres per day with all usage after office hours
- Showering for 15% of the building occupancy, 7 minutes per shower, with usage split into three concentrated periods in before office hours, lunchtime and after office hours
- Line losses and storage losses have been allowed for.

The energy use of the second-stage, water-to-water heat pump was calculated using manufacturers efficiency data. The heating load was included in the energy use calculation for the main central plant (air-to-water heat pumps).

5.3.7 Lifts

The vertical transportation within the building has considered the lifts as detailed in the RIBA Stage 3 design, using CIBSE Guide D and ISO 25745-2 methods were utilised to estimate the lift energy use.

- 2No passenger lifts in the Civic Centre, medium usage
- 1 No passenger lift in the annexe, medium usage

5.4 Onsite renewable energy generation

Solar Photovoltaics (PV) are included in this project and have been calculated using IES simulation. They use the relevant weather files and shading factors to account for the PV panels present on both the annexe and Civic Centre which are metred separately. The onsite generation was calculated in IES-VE using the inputs from the design in terms of orientation, tilt angle and shading factor provided in the vendor’s calculations.

A summary of the PV generation in accordance with the PV system specification is given in section 3.7 of this report.

Table 5—1 PV generation

Month	Annexe Generation (MWh)	Civic Building Generation (MWh)	Exported (MWh)
January	-1.4119	-1.2362	
February	-2.8295	-1.8974	
March	-5.008	-3.7458	
April	-7.3351	-5.2292	
May	-9.1727	-6.8461	
June	-10.2297	-7.8094	
July	-9.3769	-7.5375	
August	-8.9217	-6.5223	
September	-6.4828	-4.6443	
October	-3.7768	-2.8162	
November	-1.9747	-1.3657	
December	-1.3748	-0.9691	
Total	-67.8946	-50.6192	None assumed to be exported

5.5 Simulation Results

5.5.1 Estimated energy use

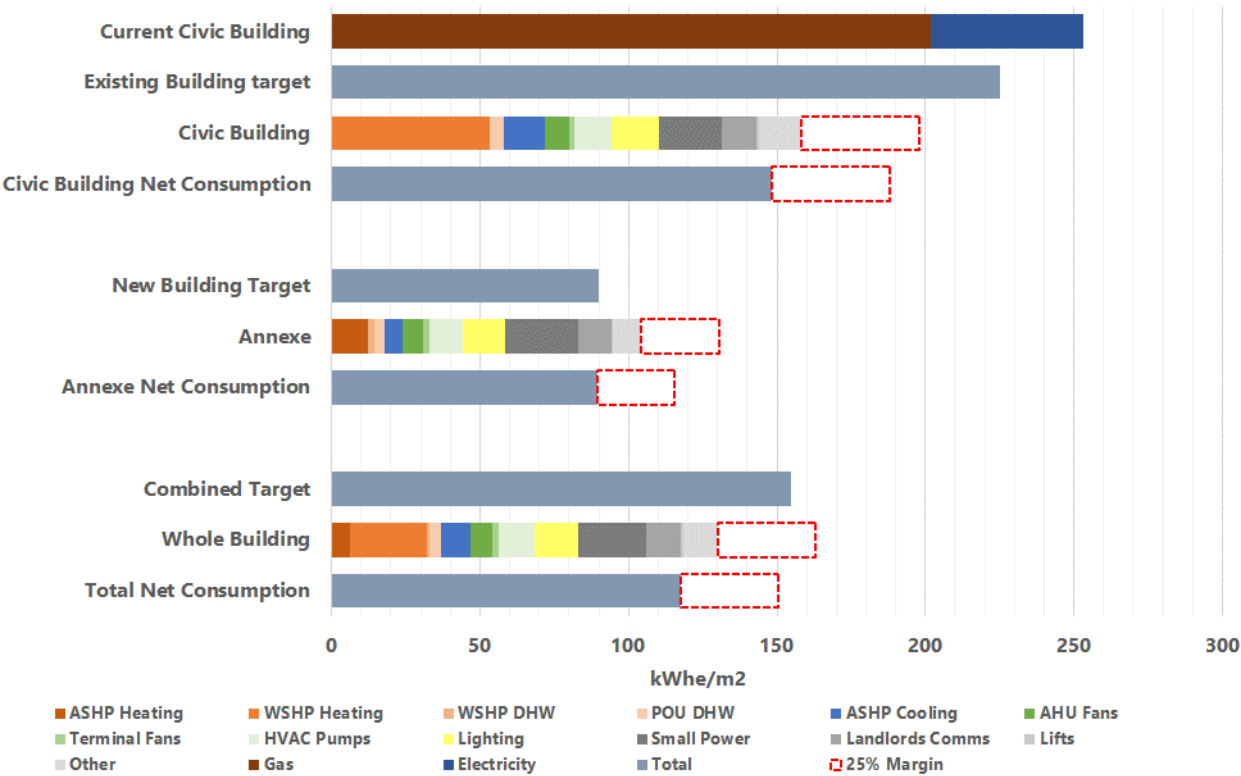


Figure 5—6 Energy consumption estimate

The Current Civic Centre energy use is based on data obtained from the DEC of the existing building. The Net Consumption bars include reduction in energy from onsite solar PV. Detailed results can be found in Appendix E.

5.5.2 Operational costs

A rough estimate of the associated operational costs has been made. This is an estimate and does not necessarily reflect the rates at which the client will pay, nor does it include standing charges.

Table 5—2 Estimated operational costs

	Whole Building
Energy End Use range (MWh)	1,166 - 1,490
Estimated operational annual costs range*	£293k - £375k

*costs based on 25.13p per kWh from Table 3.4.2 BEIS Gas and electricity prices in the non-domestic sector

5.6 Disclaimer

Computer simulation provides an estimate of performance. This estimate is based on simplifications that do not and cannot fully represent all of the intricacies of performance once built. As a result, simulation results only represent an interpretation of the potential performance. No guarantee or warranty of performance in practice can be based on simulation results alone.

Appendix A Operational Energy Model Assumptions

A.1 Drawings and specifications

The operational energy TM54 model was based on the Stage 3+ drawings, reports, and specifications provided by the project architect Hawkins Brown.

The mechanical, electrical and public health specifications and information was based on the Stage 3+ MEP report and MEP Basis of Design.

A.2 EUI Inputs

A.2.1 Building GIA calculations

The analysis has considered the Gross Internal Area (GIA) of the buildings.

Table 5—3 Floor areas

Floor Area (m2)	Civic Building	Annexe	Total
Measured Area	5,505	4,871	10,376
TM54 Modelled Area	5,298	5,184	10,482
Part L floor area	5434.7	4835.7	10,300.4

The modelled area differ from the drawing area by less than 5% and therefore no correction to the model energy consumption prediction has been applied.

A.2.2 Operational hours calculated

Energy use intensity is expected to be dependent on the hours of occupancy, and the following operational hours have been assumed.

Table 5—4 Operational hours

Building	Weekday Operating Hours	Weekend Operating Hours
Civic Centre	08:30 – 22:00	10:00-17:00 Saturdays only
Annexe	08:30-18:00	Closed

A.3 Building fabric performance

A.3.1 Thermal performance

The building fabric performance of the annexe has been determined using the LETI guidelines in order to reduce the heating and cooling demands of the building. The refurbishment to the civic centre includes additional servicing and treatment provisions in certain areas to meet the minimum standards set out in Part L.

Table 5—5 Building fabric performance

Building Element	Target Value	Units
Annexe Building		
Exposed and ground floors	0.10	W/m2K
Roof	0.11	W/m2K
External Wall	0.15	W/m2K
Windows (U-Value)	1.21	W/m2K
Windows (G-value)	0.29	
Air permeability	0.15	ach
Thermal Bridging	10%	
Existing Civic Centre – New Elements		
Windows	1.8	W/m2K
Windows (G-Value)	0.4	
Doors	1.8	W/m2K
Roof and smoke extract ventilation	3.5	W/m2K
External Wall	0.28	W/m2K
Flat Roof	0.18	W/m2K
Floors	0.22	W/m2K
Existing Civic Centre – Renovated Elements		
Wall – cavity insulated	0.55	W/m2K
Wall – external or internal insulation	0.30	W/m2K
Flat roof	0.22	W/m2K
Floors	0.18	W/m2K
Existing Civic Centre – Retained Elements		
Wall – cavity insulated	0.70	W/m2K
Wall – external or internal insulation	0.70	W/m2K
Flat Roof	0.70	W/m2K
Floors	0.35	W/m2K

A.3.2 Infiltration

Building air permeability has been assumed to achieve 3.0 m³/hr per m² of façade @ 50 Pa. To represent this air permeability in the energy model, the infiltration rate has been set at 0.290 l/s per m² façade area – results in an overall air change rate of 0.15ach, concentrated in the perimeter zones.

Infiltration has also been added to the following spaces:

- Mechanical/electrical and wet plants 0.15 ach
- Reception 1.0 ach
- All perimeter zones 0.15 ach
- All other zones 0.15 ach

A.4 Model Assumptions

The internal loads used to calculate heat gains and energy consumption are as follows

Table 5—6 Internal loads

	Lighting Power Density (W/m²)		Equipment Power Density (W/m²)		Occupancy Density (m²/person)	
	Cooling/vent Sizing	Operation at 100% on profile*	Cooling/vent Sizing	Operation at 100% on profile**	Cooling/vent Sizing	Operation at 100% on profile
Office	10	4.89	25	11	8	10
Reception	10	8.85	5	5	10	10
WCs	-	4.51	-	5	-	-
Corridors	-	5.18	-	5	-	-
Stairs	-	5.28	-	5	-	-
Plant rooms	-	2.64	-	5	-	-
Car Park	-	1.07	-	0	-	-

A.4.1 Occupancy

The building design criteria allows for 1 person per 8m2 occupancy within the upper floor offices, however for the purposes of the model 1 person per 10m2 occupancy density has been used.
Heat gains from occupants has been based on CIBSE Guide A with a sensible heat gain of 90W/person and latent heat gain of 50W/person.

A.4.2 Equipment

The building design criteria allows for 25W/m2 of on-floor equipment loads within the office tenancies, however for the purposes of the baseline model they have been based on an average 11 W/m2.

A.4.3 Internal Lighting

Average lighting power density for each space type was calculated from the RIBA Stage 3 lighting calculations and applied to the relevant templates, along with the lighting control strategy.
The energy used by tenant office lighting has not been used in the estimate.

A.4.4 Schedules

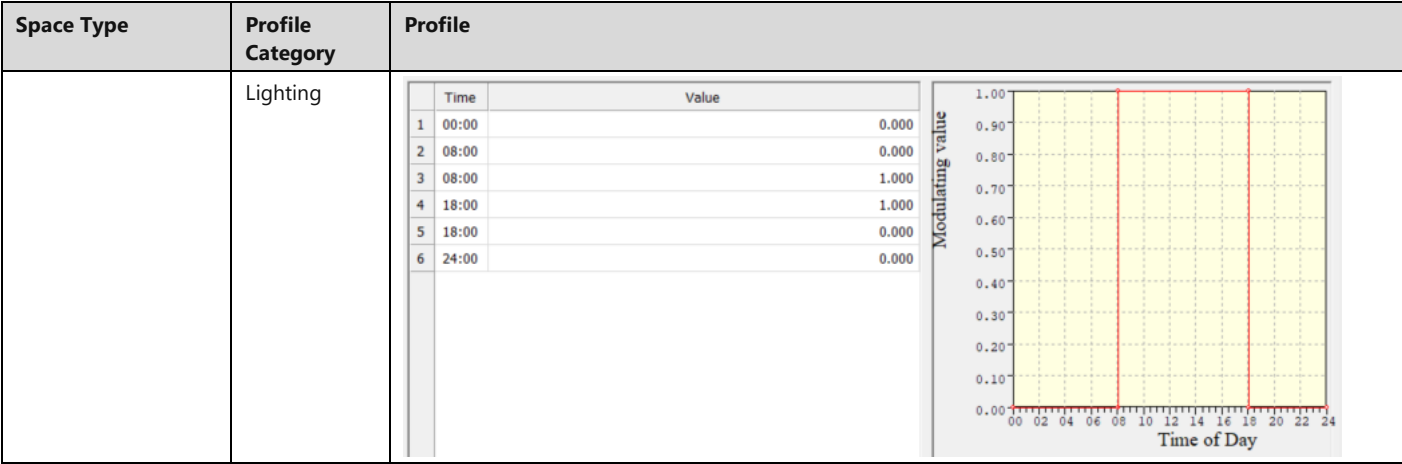
The following occupancy, lighting, equipment operation have been used in the model for all office spaces.

Table 5—7 Internal gains profiles

Space Type	Profile Category	Profile																												
Office	Occupancy	<table><thead><tr><th></th><th>Time</th><th>Value</th></tr></thead><tbody><tr><td>1</td><td>00:00</td><td>0.000</td></tr><tr><td>2</td><td>07:00</td><td>0.000</td></tr><tr><td>3</td><td>08:00</td><td>0.500</td></tr><tr><td>4</td><td>09:00</td><td>1.000</td></tr><tr><td>5</td><td>17:00</td><td>1.000</td></tr><tr><td>6</td><td>18:00</td><td>0.500</td></tr><tr><td>7</td><td>19:00</td><td>0.000</td></tr><tr><td>8</td><td>24:00</td><td>0.000</td></tr></tbody></table>		Time	Value	1	00:00	0.000	2	07:00	0.000	3	08:00	0.500	4	09:00	1.000	5	17:00	1.000	6	18:00	0.500	7	19:00	0.000	8	24:00	0.000	
		Time	Value																											
	1	00:00	0.000																											
2	07:00	0.000																												
3	08:00	0.500																												
4	09:00	1.000																												
5	17:00	1.000																												
6	18:00	0.500																												
7	19:00	0.000																												
8	24:00	0.000																												
Equipment																														
Lighting		<table><thead><tr><th></th><th>Time</th><th>Value</th></tr></thead><tbody><tr><td>1</td><td>00:00</td><td>0.000</td></tr><tr><td>2</td><td>08:00</td><td>0.000</td></tr><tr><td>3</td><td>08:00</td><td>1.000</td></tr><tr><td>4</td><td>18:00</td><td>1.000</td></tr><tr><td>5</td><td>18:00</td><td>0.000</td></tr><tr><td>6</td><td>24:00</td><td>0.000</td></tr></tbody></table>		Time	Value	1	00:00	0.000	2	08:00	0.000	3	08:00	1.000	4	18:00	1.000	5	18:00	0.000	6	24:00	0.000							
	Time	Value																												
1	00:00	0.000																												
2	08:00	0.000																												
3	08:00	1.000																												
4	18:00	1.000																												
5	18:00	0.000																												
6	24:00	0.000																												
Lobby/Reception	Occupancy	<table><thead><tr><th></th><th>Time</th><th>Value</th></tr></thead><tbody><tr><td>1</td><td>00:00</td><td>0.000</td></tr><tr><td>2</td><td>09:00</td><td>0.000</td></tr><tr><td>3</td><td>09:00</td><td>1.000</td></tr><tr><td>4</td><td>17:00</td><td>1.000</td></tr><tr><td>5</td><td>17:00</td><td>0.000</td></tr><tr><td>6</td><td>24:00</td><td>0.000</td></tr></tbody></table>		Time	Value	1	00:00	0.000	2	09:00	0.000	3	09:00	1.000	4	17:00	1.000	5	17:00	0.000	6	24:00	0.000							
		Time	Value																											
	1	00:00	0.000																											
2	09:00	0.000																												
3	09:00	1.000																												
4	17:00	1.000																												
5	17:00	0.000																												
6	24:00	0.000																												
Equipment																														
Lighting		<table><thead><tr><th></th><th>Time</th><th>Value</th></tr></thead><tbody><tr><td>1</td><td>00:00</td><td>0.300</td></tr><tr><td>2</td><td>08:00</td><td>0.300</td></tr><tr><td>3</td><td>08:00</td><td>1.000</td></tr><tr><td>4</td><td>19:00</td><td>1.000</td></tr><tr><td>5</td><td>19:00</td><td>0.300</td></tr><tr><td>6</td><td>24:00</td><td>0.300</td></tr></tbody></table>		Time	Value	1	00:00	0.300	2	08:00	0.300	3	08:00	1.000	4	19:00	1.000	5	19:00	0.300	6	24:00	0.300							
	Time	Value																												
1	00:00	0.300																												
2	08:00	0.300																												
3	08:00	1.000																												
4	19:00	1.000																												
5	19:00	0.300																												
6	24:00	0.300																												
Welcome Area (Weekday)	Occupancy																													

Space Type	Profile Category	Profile																																					
	Equipment	<table><tr><th></th><th>Time</th><th>Value</th></tr><tr><td>1</td><td>00:00</td><td>0.000</td></tr><tr><td>2</td><td>08:30</td><td>0.000</td></tr><tr><td>3</td><td>08:30</td><td>1.000</td></tr><tr><td>4</td><td>22:00</td><td>1.000</td></tr><tr><td>5</td><td>22:00</td><td>0.000</td></tr><tr><td>6</td><td>24:00</td><td>0.000</td></tr><tr><td></td><td></td><td></td></tr></table>		Time	Value	1	00:00	0.000	2	08:30	0.000	3	08:30	1.000	4	22:00	1.000	5	22:00	0.000	6	24:00	0.000																
		Time	Value																																				
1	00:00	0.000																																					
2	08:30	0.000																																					
3	08:30	1.000																																					
4	22:00	1.000																																					
5	22:00	0.000																																					
6	24:00	0.000																																					
	Lighting	<table><tr><th></th><th>Time</th><th>Value</th></tr><tr><td>1</td><td>00:00</td><td>0.300</td></tr><tr><td>2</td><td>08:00</td><td>0.300</td></tr><tr><td>3</td><td>08:00</td><td>1.000</td></tr><tr><td>4</td><td>19:00</td><td>1.000</td></tr><tr><td>5</td><td>19:00</td><td>0.300</td></tr><tr><td>6</td><td>24:00</td><td>0.300</td></tr><tr><td></td><td></td><td></td></tr></table>		Time	Value	1	00:00	0.300	2	08:00	0.300	3	08:00	1.000	4	19:00	1.000	5	19:00	0.300	6	24:00	0.300																
	Time	Value																																					
1	00:00	0.300																																					
2	08:00	0.300																																					
3	08:00	1.000																																					
4	19:00	1.000																																					
5	19:00	0.300																																					
6	24:00	0.300																																					
Welcome Area (Weekend)	Occupancy	<table><tr><th></th><th>Time</th><th>Value</th></tr><tr><td>1</td><td>00:00</td><td>0.000</td></tr><tr><td>2</td><td>10:30</td><td>0.000</td></tr><tr><td>3</td><td>10:30</td><td>0.500</td></tr><tr><td>4</td><td>11:00</td><td>0.500</td></tr><tr><td>5</td><td>11:00</td><td>1.000</td></tr><tr><td>6</td><td>16:00</td><td>1.000</td></tr><tr><td>7</td><td>16:00</td><td>0.500</td></tr><tr><td>8</td><td>17:00</td><td>0.500</td></tr><tr><td>9</td><td>17:00</td><td>0.000</td></tr><tr><td>10</td><td>24:00</td><td>0.000</td></tr><tr><td></td><td></td><td></td></tr></table>		Time	Value	1	00:00	0.000	2	10:30	0.000	3	10:30	0.500	4	11:00	0.500	5	11:00	1.000	6	16:00	1.000	7	16:00	0.500	8	17:00	0.500	9	17:00	0.000	10	24:00	0.000				
		Time	Value																																				
1	00:00	0.000																																					
2	10:30	0.000																																					
3	10:30	0.500																																					
4	11:00	0.500																																					
5	11:00	1.000																																					
6	16:00	1.000																																					
7	16:00	0.500																																					
8	17:00	0.500																																					
9	17:00	0.000																																					
10	24:00	0.000																																					
	Equipment	<table><tr><th></th><th>Time</th><th>Value</th></tr><tr><td></td><td></td><td></td></tr></table>		Time	Value																																		
	Time	Value																																					
	Lighting	<table><tr><th></th><th>Time</th><th>Value</th></tr><tr><td>1</td><td>00:00</td><td>0.300</td></tr><tr><td>2</td><td>09:00</td><td>0.300</td></tr><tr><td>3</td><td>09:00</td><td>1.000</td></tr><tr><td>4</td><td>17:00</td><td>1.000</td></tr><tr><td>5</td><td>17:00</td><td>0.300</td></tr><tr><td>6</td><td>24:00</td><td>0.300</td></tr><tr><td></td><td></td><td></td></tr></table>		Time	Value	1	00:00	0.300	2	09:00	0.300	3	09:00	1.000	4	17:00	1.000	5	17:00	0.300	6	24:00	0.300																
	Time	Value																																					
1	00:00	0.300																																					
2	09:00	0.300																																					
3	09:00	1.000																																					
4	17:00	1.000																																					
5	17:00	0.300																																					
6	24:00	0.300																																					

Space Type	Profile Category	Profile				
Meeting Rooms	Occupancy		Time	Value		
		1	00:00	0.000		
		2	07:00	0.000		
		3	10:30	0.000		
		4	10:30	0.500		
		5	11:00	0.500		
	Equipment	6	11:00	1.000		
		7	17:00	1.000		
		8	17:00	0.500		
		9	18:00	0.500		
		10	18:00	0.000		
		11	24:00	0.000		
	Lighting		Time	Value		
		1	00:00	0.300		
		2	08:00	0.300		
		3	08:00	1.000		
		4	19:00	1.000		
		5	19:00	0.300		
		6	24:00	0.300		
	Civic Chamber	Occupancy		Time	Value	
			1	00:00	0.000	
			2	09:00	0.000	
3			09:00	1.000		
Equipment		4	11:00	1.000		
		5	11:00	0.000		
		6	24:00	0.000		
Lighting						
		Study Rooms	Occupancy		Time	Value
				1	00:00	0.000
				2	08:00	0.000
3	08:00			1.000		
4	17:00			1.000		
5	17:00			0.000		
Equipment	6		24:00	0.000		



A.4.5 Domestic hot water

The daily weekday hot-water demand for the offices has been estimated for the showering facilities and handwashing and cleaning within the toilet cores.

The volume of water at the shower outlet temperature of 38°C has been calculated at 3,862 litres a day based on 15% of the buildings population (250 people) taking a shower each day with hot water flow rate of 4 l/min per shower. Water usage was spread over the day with the maximum at the start of the day, some usage around lunchtime, and minimal consumption at the end of the day.

The volume of DHW at the WHB outlet temperature of 41°C for handwashing and office cleaning was assumed to be 2l/person/weekday spread over the day based on the office occupancy profile. The daily DHW usage at weekends was reduced in proportion to the weekend office occupancy.

Table 5—8 DHW usage profiles

Time period	Shower Profile Weekday	Toilets Profile Weekday	Cleaners DHW Profile Weekday	Toilets DHW Profile Sunday
0000-0100	0%	0%	0%	0%
0100-0200	0%	0%	0%	0%
0200-0300	0%	0%	0%	0%
0300-0400	0%	0%	0%	0%
0400-0500	0%	0%	0%	0%
0500-0600	0%	0%	0%	0%
0600-0700	25%	0%	0%	0%
0700-0800	25%	0%	0%	0%
0800-0900	25%	10%	0%	0%
0900-1000	0%	10%	0%	0%
1000-1100	0%	10%	0%	0%
1100-1200	0%	10%	0%	0%
1200-1300	10%	10%	0%	0%
1300-1400	10%	10%	0%	0%
1400-1500	0%	10%	0%	0%
1500-1600	0%	10%	0%	0%
1600-1700	0%	10%	0%	0%
1700-1800	5%	10%	0%	0%
1800-1900	0%	10%	0%	0%

Time period	Shower Profile Weekday	Toilets Profile Weekday	Cleaners DHW Profile Weekday	Toilets DHW Profile Sunday
1900-2000	0%	0%	50%	0%
2000-2100	0%	0%	50%	0%
2100-2200	0%	0%	0%	0%
2200-2300	0%	0%	0%	0%
2300-2400	0%	0%	0%	0%

A.4.6 Air and water source heat pumps

As detailed performance data was not available for the heat pumps the following conservative seasonal efficiencies have been assumed.

Table 5—9 ASHP and WSH seasonal efficiencies

	Heating
Annexe ASHP	3.5
Civic Building combined ASHP & WSHP	2.5

Heat pumps are expected to have a similar lifespan to a gas boiler and should be regularly checked and maintained.

A.4.7 DHW water source heat pump

The domestic hot water for the showers is provided using a water-to-water heat pump that draws heat from the LTHW circuit. The part-load profile was obtained from the manufacturer and was used in the energy estimate.

Table 5—10 water source heat pump part load profile

Load (%)	100	90	80	70	60	50	40	30	20	10
COP (kW/kW)	4.74	4.74	4.74	4.73	4.73	4.72	4.61	4.42	4.10	3.36

The following components were included in the model

Table 5—11 DHW system assumptions

DHW	Units	Main Building
Fuel		Electricity
Generator		Heat pump delivering water at 70oC from the LTHW circuit at 45oC
Storage Capacity	Litres	900
Storage loss factor	kWh/l/day	3.7
Secondary circulation pipe losses	W/m	8
Secondary circulation pipe length	m	50

Pump power consumption was calculated outside of the model based on the predicted hourly DHW demand from the model.

A.4.8 Mechanical Ventilation

The AHU operating assumptions used in the model are detailed below.

Table 5—12 AHU operational assumptions

AHU		Maximum Duty (m3/s)	Max. Demand in Normal Mode (kW)	Weekday on	Weekday Off	Saturday On	Saturday Off
AHU/B1/01	Supply	3.1	2.7	08:30	22:00	10:00	20:00
	Extract	3.1	2.38	08:30	22:00	10:00	20:00
AHU/B1/02	Supply	2.3	2.13	08:30	22:00		
	Extract	2.3	1.62	08:30	22:00		
AHU/B1/03	Supply	6.5	6.12	08:30	22:00		
	Extract	6.5	4.72	08:30	22:00		
AHU/00/01	Supply	6.5	6.12	08:30	22:00	10:00	20:00
	Extract	6.5	4.72	08:30	22:00	10:00	20:00
AHU/03/01	Supply	6.5	6.12	08:30	22:00	10:00	20:00
	Extract	6.5	4.72	08:30	22:00	10:00	20:00
AHU/L3/02	Supply	5.4	4.74	08:30	22:00		
	Extract	5.4	3.93	08:30	22:00		
AHU/L3/03	Supply	0.9	1.61	08:30	18:00		
	Extract	0.9	1.27	08:30	18:00		
AHU/L3/04	Supply	0.9	1.61	08:30	18:00		
	Extract	0.9	1.27	08:30	18:00		
AHU/L3/05	Supply	0.9	1.61	08:30	18:00	10:00	20:00
	Extract	0.9	1.27	08:30	18:00	10:00	20:00
AHU/L3/06	Supply	0.56	0.5	08:30	18:00	10:00	20:00
	Extract	0.8	0.72	08:30	18:00	10:00	20:00
HRU/B1/01	Supply	0.5	0.45	08:30	22:00		
	Extract	0.5	0.45	08:30	22:00		
HRU/L0/01	Supply	0.56	0.5	08:30	22:00	10:00	20:00
	Extract	0.8	0.72	08:30	22:00	10:00	20:00
HRU/L0/02	Supply	0.5	0.45	08:30	18:00		
	Extract	0.5	0.45	08:30	18:00		
HRU/L0/03	Supply	0.56	0.5	08:30	18:00		
	Extract	0.8	0.72	08:30	18:00		
HRU/L1/01	Supply	0.5	0.45	08:30	22:00	10:00	20:00
	Extract	0.5	0.45	08:30	22:00	10:00	20:00
HRU/L3/01	Supply	0.56	0.5	08:30	22:00		
	Extract	0.8	0.72	08:30	22:00		
HRU/L3/01	Supply	0.5	0.45	08:30	22:00		
	Extract	0.5	0.45	08:30	22:00		

In addition, energy consumption of fans not specifically modelled were included in the estimate.

Table 5—13 Miscellaneous system fan assumptions

Fan reference	System	Air Volume (l/s)	Motor size (W)	Max SFP (W/l/s)	Energy consumption (W)	Annual run hours	Annual Energy (kWh)
EF.00.01	Waste Store	No information					Excluded

A.4.9 Pumps

For the calculation of pumping energy, a pump power density of 1.8W/m2 has been allowed. The power density will need to be specifically calculated at RIBA Stage 4

A.4.10 Vertical transportation

The vertical transportation strategy includes 3 Passenger lifts installed in the building. The lift cycle reference energy has been assumed as category 3. The Lift energy has been calculated using CIBSE guide D and ISO 25745-2 (2015) and based on the manufacturer data as below:

Table 5—14 Lift energy consumption data

	Annex	Civic 1	Civic 2	Total
Number of Lifts	1	1	1	3
Usage Category	3	3	3	
Lift Type	Traction	Traction	Traction	
Rated Load	1250	1250	1250	
Rated Speed	1.6	1.6	1.6	
Travel distance	12.5	14	14	
Number of Floors	4	5	5	
Counterbalancing	50%	50%	50%	
Acceleration	0.6	0.6	0.6	
Jerk	1.4	1.4	1.4	
Door operation time	8	8	8	
short cycle one way travel distance	8	10	10	
Idle mode power	180	180	180	
standby power after 5 mins	160	160	160	
standby power after 30 mins	100	100	100	
operating days per year	365	365	365	
Reference cycle running energy consumption	15	15	15	
Short Cycle running energy consumption	10	10	10	
Trips per day	300	300	300	
Average travel distance	6.1	6.9	6.9	
Average running energy per metre	0.6	0.6	0.6	
Lookup for fraction of travel distance	4	4	4	
Start Stop Energy Consumption	0.556	-1.250	-1.250	
Running energy average cycle with empty car	7.92	6.08	6.08	
Daily running energy	1,100	844	844	
Load factor	0.93	0.93	0.93	
Average Car Load (% of rated load)	4.5	4.5	4.5	

	Annex	Civic 1	Civic 2	Total
running time per day	1.24	1.28	1.28	
time to travel average distance	14.923	15.383	15.383	
non running time per day	22.76	22.72	22.72	
Idle	36	36	36	
5 min standby	31	31	31	
30 min standby	33	33	33	
Daily non running energy consumption	3,354	3,349	3,349	
Total energy consumption per day	4,454	4,193	4,193	
Total energy consumption per year	1,625,766	1,530,317	1,530,317	
Performance level for running	0.48	0.33	0.33	
Specific running energy for reference cycle	0.48	0.43	0.43	
Energy Efficiency Class	C	C	C	
Running Performance Level	1	1	1	
Idle/Standby Efficiency Level	3	3	3	
Total lift power consumption (kWh/year)	1,626	1,530	1,530	4,686

A.4.11 External Lighting

Electricity used from the façade external lighting has not been specifically calculated and therefore included in the other electricity end use category.

A.5 End use categories

The end use categories of building energy consumption are described below.

Table 5—15 Energy end use category definitions

End Use	Description
Hot Water Production	Electrical energy consumption of heat pumps generating ULTHW water to serve radiators, door curtains, underfloor heating, and AHU and FCU cooling coils
Chilled Water Production	Electrical energy consumption of heat pumps generating CHW to serve AHU and FCU cooling coils
Packaged AC (split or VRF)	Ground floor security room VRF heating and cooling, Comms room split cooling
HVAC Fans (FCU)	
HVAC Fans (Landlords)	Office AHU fans
HVAC Pumps	This includes the LTHW and CHW primary and secondary pumps as well as DHW primary and secondary pumps, MCW boosters, and irrigation pumps

Common Area Lighting (exclude car parks)	Lighting energy consumption of landlords and shared spaces
Common Area Power	Power consumption covering all landlord areas including Comms, BMS, Fire alarms and other landlord systems
Tenants Lighting	Lighting energy consumption within the office tenant areas
Tenants Power	Power consumption of tenants equipment
Lifts (excluding lift motor room ventilation and cooling)	This includes all 6 lifts serving the building
Miscellaneous Ventilation (fans to unconditioned spaces)	Miscellaneous landlords ventilation and extract systems including refuse store
Domestic Hot Water (heating, trace heating, and pumping)	The energy consumption of the DHW system to generate the DHW and covers losses associated with the DHW cylinders and secondary circulation pipework
On site PV Generation	The electricity generated by the roof mounted PV system
Other	This includes electricity from miscellaneous unidentified sources that have not been broken out by end use. Examples are water booster pumps, BMS system power consumption etc.

A.6 Energy consumption breakdown

Energy consumption breakdown for each model is summarised below.

Table 5—16 Summary of energy consumption breakdown by end use

Energy End Use (kWh/m2)	Whole Building	Annexe	Civic Building
ASHP Heating	6.4	12.3	0.0
ASHP/WSHP Heating	25.6	0.0	53.5
WSHP DHW	1.1	2.2	0.0
POU DHW	3.9	3.3	4.5
ASHP Cooling	9.9	6.3	13.8
AHU Fans	7.4	6.7	8.1
Terminal Fans	2.1	2.1	2.1
HVAC Pumps	11.9	11.5	12.3
Lighting	15.0	14.0	16.0
Small Power	22.8	24.6	21.0
Landlords Comms	11.6	11.3	12.0
Lifts	0.6	0.6	0.6
Other	11.8	9.5	14.4
On site Generation (PV)	-12.49	-14.93	-9.85
Total	117.69	89.36	148.45
Target	154.7	90.0	225.0
25% Operational Margin	32.5	26.1	39.6
Potential Maximum Total	150.2	115.43	188.0

Appendix B GLA Emissions Reporting Development Information

B.1 Table 1

TABLE 1. APPLICATION COMPLETENESS CHECK	
Development information tab (Tables 1-4) completed and included in appendix of energy strategy?	yes
Part L outputs tab completed	yes
EUI & space heating demand completed	yes
Confirmation that the planning stage webform will be completed at planning application submission and that the Be Seen process and reporting responsibilities are fully understood, including the requirement for as-built and in-use stage reporting to be undertaken (or where the legal owner changes from one reporting stage to another that the responsible party will be notified).	yes

B.2 Table 2

TABLE 2. DEVELOPMENT DETAILS		Further notes	Response	Supporting comments (or signpost sections in the energy assessment)
Application details	Date of Application	Please provide the date the application was submitted to the Local Planning Authority.	17/04/2023	
	Local Planning Authority	Please indicate the Local Planning Authority determining the application.	Haringey	
	Confirmed carbon offset price (£/tonne of carbon dioxide)	Please confirm the agreed carbon offset price for the Local Planning Authority. If no value is entered then the GLA's recommend price of £95 per tonne of carbon dioxide will be used.	104.50	£95 + 10%
	Evidence of communication on the carbon offset price included in the energy assessment (Y/N).		N	
	Residential units number (Part L1)			
	Non-residential floor area in m² (Part L2)		10273.80	
Heat risk	CIBSE TM59 undertaken for residential development (Y/N)			
	CIBSE TM52 undertaken for non-residential development (Y/N)		Y	Refer to the comfort report HCC-BHE-XX-XX-IE-YB-000002-P02
	All sample units meet CIBSE criteria with DSY1 weather file (Y/N)		Y	All office occupied spaces
	DSY2 and DSY3 included in overheating assessments (Y/N)		Y	
	Residential g-value		0.40 / 0.29	CivicBuilding / New Annex office glazing
	% Glazing Ratio over façade		>40%	In the New Annex. The Civic Centre glazing areas are as existing
	External shading proposed (Y/N)		Y	
Energy efficiency measures	Target Fabric Energy Efficiency met (Y/N)		Y	
	Mechanical Ventilation with Heat Recovery included (Y/N)		Y	Targeting 80% efficiency
	Waste Water Heat Recovery (Y/N)		N	
	Low energy lighting (Y/N)		Y	LED lighting throughout
District heating connection	Development in a Heat Network Priority Area (HNPA) (Y/N)			
	District Heating Network connection (Y/N)			

TABLE 2. DEVELOPMENT DETAILS		Further notes	Response	Supporting comments (or signpost sections in the energy assessment)
	Name of District Heating Network			
	Carbon factor (kgCO ₂ / kWh)			
	Borough energy officer and Heat Network Operator contacted and evidence of correspondence included in the energy strategy (Y/N)	Applicable to all applications.		
Site heating distribution configuration	Development future proofed for DHN connection (Y/N)	Note that individual heating systems would not be appropriate for developments in HNPA.s.	Y	
	Drawings of communal system provided (Y/N)	Applicants should provide a drawings of the energy centre, on-site communal network with all building uses connected and future proofing arrangements detailed, including single point of connection.	N	
	Distribution type			
	Flow temperature (°C)			
	Return temperature (°C)			
	Distribution losses modelled (%)	See table 4 below for details.		
Heating system performance	Heat Pump (Y/N)		Y	
	Heat Pump source		Air Source	
	Centralised Heat Pump capacity (kWth)		1076.00	Existing building and new annexe combined ASHP heat output
	Heat Pump Seasonal Heating Efficiency (SCoP)		3.5 / 4.0	Civic Building / New annex
	Heat Pump SCoP calculation includes heat source and heat distribution temperature and seasonal performance factor (Y/N)	See table 5 below for details.	Y	
	Fraction of heat supplied by heat pump (only for hybrid systems with boilers) (%)			
	Low-emission on-site CHP enabling an area-wide heat network (Y/N)	<u>Only</u> low-emission CHP is suitable and <u>only</u> where it is facilitating an area-wide heat network. Therefore, new gas engine CHP is not suitable for any other purpose for new developments.	N	
	CHP (kWe)			
	Estimated end user cost (pence/kWh)			
	Energy assessment includes consideration of occupant running costs (Y/N)	Applicants should consider the estimated costs to occupants of the energy assessment and outline how they are committed to protecting the consumer from high prices.	Y	
Solar technologies	Solar PV included (Y/N)		Y	
	Roof layout demonstrating solar PV technologies have been maximised included in energy strategy (Y/N)		Y	
	kWh generated		124938.00	
	kWp		140.02	
	Total PV panel area (m²) installed		664.00	
	Solar Thermal included (Y/N)		N	
	Solar Thermal panel area (m²) installed			
Flexibility and peak energy demand	Site-wide peak demand, capacity and flexibility potential included in energy assessment (Y/N)	Table 9 in the energy assessment guidance to be completed.		
	Interventions for achieving flexibility included in energy assessment (Y/N)	Table 10 in the energy assessment guidance to be completed.		
	Estimated peak demand (MW)			
	Electrical energy storage (kWh) capacity			
	Heat energy storage (kWh) capacity			

TABLE 2. DEVELOPMENT DETAILS		Further notes	Response	Supporting comments (or signpost sections in the energy assessment)
Other technologies	System type (e.g. wind turbine)			
	Capacity (kW)			
Cooling	Cooling proposed - Residential (Y/N)	It is not expected that 'active cooling' will be proposed for any residential developments. It will be expected that applicants can fully demonstrate that all passive design measures have been thoroughly investigated before considering 'active cooling'.		
	Cooling proposed - Non-residential (Y/N)		Y	
	Residential Cooling consumption (kWh p.a.)	See note in cell C60.		
	Commercial Cooling consumption (MJ p.a.)		370000.00	based on the Be Seen energy prediction

B.3 Table 3

Not applicable

B.4 Table 4

Not applicable

Appendix C BRUKL Documents

The following BRUKL output files should be references:

- Existing Haringey Civic Centre Baseline Stage 3+_brukl
- Refurbished Haringey Civic Centre Lean Stage 3+_brukl
- Refurbished Haringey Civic Centre Clean Stage 3+_brukl
- Refurbished Haringey Civic Centre Green Stage 3+_brukl
- Haringey New Annex Lean Stage 3+_brukl
- Haringey New Annex Clean Stage 3+_brukl
- Haringey New Annex Green Stage 3+_brukl

Kevin Becerril
Buro Happold Limited
Camden Mill
Lower Bristol Road
Bath
BA2 3DQ
UK

T: +44 (0)1225 320 600
F: +44 (0)870 787 4148
Email: Imogen.Snell@burohappold.com