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UXBRIDGE CO-LIVING AND HOTEL

TM54 OPERATIONAL ENERGY EVALUATION REPORT

28/10/24

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DNA Uxbridge Ltd

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CONTENTS

1. EXECUTIVE SUMMARY

This report evaluates operational energy use of the two developments (Hotel and CoLiving) within the proposed Uxbridge development using dynamic simulation modelling methods. This analysis is performed according to the guidance described in CIBSE Technical Memorandum 54 (TM54) – Evaluating operational energy use at the design stage.

In line with the London Plan, this report supports the buildings' strategic planning application to the GLA. Calculation of unregulated carbon emissions is done in compliance with the 'be seen' policy and associated guidance.

The TM54 assessment predicted the non-domestic spaces of the development to have an Energy Use Intensity (EUI) of approximately **60.61 kWh/m²/annum** with space heating amounting to **11.95 kWh/m²/annum** for the Hotel and approximately **61.36 kWh/m2/annum** with space heating amounting **10.55 kWh/m2/annum** for the CoLiving space**.**

The results for the building energy and carbon performance indicators are summarised in the table below. Values presented are to be used in the GLA 'Be Seen' Reporting Spreadsheet.

Table 1 Baseline TM54 Results

Building Type		Total Predicted	Total Intensity
Hotel	Electricity Usage	433.38 MWh/yr	60.61 kWh/m^2/yr
	Carbon Emissions	63,273.33 $kgCO_2$/yr	8.85 $kgCO_2/m^2$/yr
CoLiving	Electricity Usage	895.08 MWh/yr	61.36 kWh/m^2/yr
	Carbon Emissions	130,681.81 $kgCO_2$/yr	8.96 $kgCO_2/m^2$/yr

To allow useful benchmarking against existing buildings, the commercial units considered on their own results in the following building energy and carbon performance indicators.

Table 2 Benchmark TM54 Results

Building Type		CIBSE Guide F Benchmark (All electric good practice)
Hotel & CoLiving*	Electricity Usage	103 kWh/$m^2_{holiday}$/yr**
	Carbon Emissions	15.04 $kgCO_2$/yr

*CoLiving assumed to be compared to the Type 2 Hotel CIBSE Guide F Benchmark due to its similarities with the Hotel.
**Type 2 Hotel benchmark used with corrected figures for cooling and ventilation fans, pumps and controls.

2. INTRODUCTION

The aim of this report is to evaluate the operational energy use of the two developments within the proposed the Uxbridge Hotel and CoLiving development using dynamic simulation modelling methods. This analysis is performed according to the guidance described in CIBSE Technical Memorandum 54 (TM54) – Evaluating operational energy use at the design stage.

The proposals comprise the demolition of the existing buildings and structures on site to provide a mixed-use development comprising Hotel (Class C1), Co-Living (Class Sui Generis) and replacement commercial floor space (Class E). The proposals include landscape improvements including the provision of a pocket park, car and cycle parking, and associated infrastructure. This report is concerned with the energy use within the Hotel and the CoLiving blocks.

Building energy estimations made at the design stage and for building regulations compliance is often found to be significantly different from actual energy use in a building's operation. This gap in end figures is primary due to the exclusion of unregulated energy uses such as small power, external lighting, lifts etc. The London Plan's fourth 'be seen' stage of the energy hierarchy (Figure 1) requires the monitoring and reporting of operational energy - ensuring actual energy and carbon performance of a building is aligned with the estimated energy and carbon performance will be a key factor in managing operational energy and hence achieving a zero carbon London.

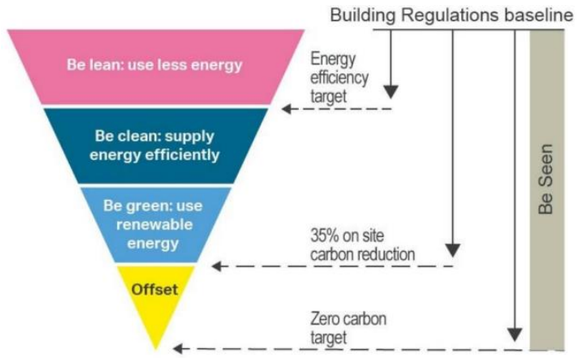

Figure 1 The London Plan energy hierarchy (Source: Greater London Authority)

TM54 is a methodology used to undertake better-informed calculations of energy use in operation and produce performance targets against which measured performance in use can be compared. This approach also aligns with the reporting requirements under the GLA's Whole Life-Cycle Carbon (WLC) Assessment Guidance.

The proposed development has been assessed under TM54 through dynamic thermal modelling by using Integrated Environmental Solutions Virtual Environment (IES VE) 2023 v5.2.0 which complies with CIBSE AM11: Building performance modelling (2015b). IES VE is used by sustainable design experts around the globe as it is an in-depth suite of integrated analysis tools for the design and retrofit of buildings. The platform allows designers to test different options, identify passive solutions, compare low carbon & renewable technologies, and draw conclusions on energy use, CO_2 emissions and occupant comfort.

3. SIMULATION INPUTS

The model has been created based on the information received from the relevant parties at the time of this report's publication. This includes floor plans, building usage, u-values, ventilation strategies, weather, and site conditions.

As it is a Hotel and a CoLiving space, it will be necessary to make reasonable assumptions about the occupational hours and occupancy factors.

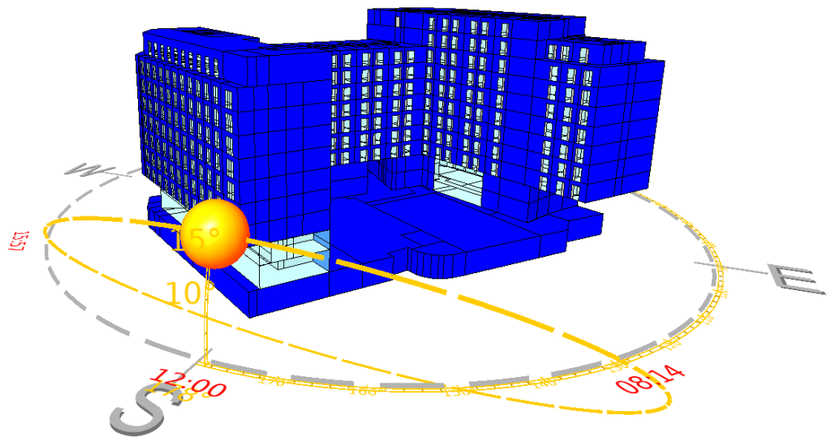

Figure 2 Thermal model of the Uxbridge CoLiving (North) and Hotel (South) development showing building orientation.

Weather File

The proposed development is in London (Figure 3). Therefore, this energy assessment has been carried out using the following weather file to simulate the building within its expected climate.

- London_TRY.epw

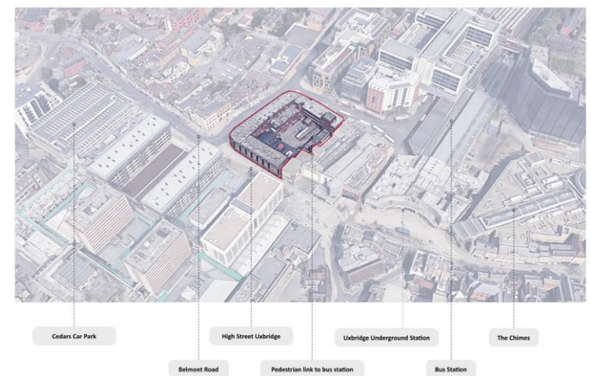

Figure 3 Building Site Location Within London

A TRY (Test Reference Year) weather file is a representation of a typical current weather year. For building's where heating and/or cooling are dominant loads, the energy consumption will be relatively more affected by the variation from this reference weather.

Building Fabric

The table below details a summary of the building fabric details used for the assessment. These inputs have been reviewed and confirmed with the design team, aligning with inputs to the Part L assessments. It is the responsibility of the design team to provide notice to the energy assessor if these performance figures have changed or are different to those specified.

Table 3 Building Fabric Specification

ELEMENT	FABRIC PARAMETERS
Walls	0.15 W/m^{2}K
Floor	0.15 W/m^{2}K
Roof	0.15 W/m^{2}K
Windows	1.40 W/m^{2}K (g-value:0.4)
Personnel Doors	1.60 W/m^{2}K
Internal Ceiling/Floor	1.1 W/m^{2}K
Internal Partition	1.8 W/m^{2}K
Air Permeability	3 m^3/h/m^2 @ 50Pa. CIBSE Guide A equivalent infiltration of 0.15ach.

Building Services Equipment

a) Ventilation

Table 4 Ventilation Specification

BUILDING USE	PARAMETER	PROPOSED DESIGN
Co-Living Block and Amenity Spaces	Mechanical Ventilation with Heat Recovery (MVHR)	Heat Recovery: 87%, SFP: 1.9 W/(l/s)
	Central Air Handling Units (Amenity)	Heat Recovery: 87% SFP: 1.9 W/(l/s)
	Central Air Handling Units (Residential Units)	Heat Recovery: 90% SFP: 0.52 W/(l/s)
	Mechanical Extract	SFP: 0.4 W/(l/s)
Hotel Block and Retail Spaces	Mechanical Ventilation with Heat Recovery (MVHR) (Retail)	Heat Recovery: 85%, SFP: 0.40 W/(l/s)
	Central Air Handling Units (Hotel)	Heat Recovery: 85% SFP: 1.1 W/(l/s)
	Mechanical Extract	SFP: 0.4 W/(l/s)

b) Space Heating/Cooling

Table 5 Space Heating/Cooling Specification

BUILDING USE	SYSTEM	DESCRIPTION & INPUTS
Co-Living Block and Amenity Spaces	Local MVHR VRF (Amenity)	Heat Source: Electricity SCOP: 5.98 SEER: 9.16
	NV ASHP Rads	Heat Source: Electricity SCOP: 3.13
	Central AHU VRF (Co-Living Amenity)	Heat Source: Electricity SCOP: 5.98 SEER: 9.16
	Central AHU VRF (Co-Living Apts)	Heat Source: Electricity SCOP: 6.19 SEER: 9.16
Hotel Block and Retail Spaces	NV ASHP Rads	Heat Source: Electricity SCOP: 3.66
	Central AHU VRF (Hotel)	Heat Source: Electricity SCOP: 5.98 SEER: 9.16
	Local MVHR VRF (Retail)	Heat Source: Electricity SCOP: 5.98 SEER: 9.16

All pumps are variable speed with multiple pressure sensors across pump. Ductwork leakage is class A and AHU leakage class is L2. Metering is present and warns of 'out-of-range' values.

Thermal Comfort Set Points

Below are the heating and cooling setpoints utilised in this operational energy analysis for rooms with space conditioning.

Table 6 Heating and Cooling Setpoints on the Hotel and CoLiving

SPACE TYPES	HEATING SET POINT (^{0}C)	COOLING SET POINT (^{0}C)
Amenity	19	21
Hotel Bedrooms	21	23
Circulation	17	-
Kitchen	15	18
Hotel Bathrooms	20	23
Reception	19	21
Staff/Office/BOH	21	23
Public WCs	20	23
Retail	19	21
Gym	16	18
Meeting and Office Room	21	23
CoLiving Bedrooms	20	22
Comms Room	19	22
CoLiving Bathrooms	20	23

Occupancy

Building occupancy have been assumed at this stage to align with CIBSE Guide A benchmark allowance for a Retail Store, Hotel and Residential. Occupancy profiles have been adopted either from the National Calculation Methodology (NCM), CIBSE TM59:2017 "Design methodology for the assessment of overheating risk in homes" or assumed based on benchmarks of similar type projects.

Table 7 Space occupancy descriptions for Hotel and CoLiving

SPACE TYPES	MAXIMUM OCCUPANCY	PROFILE
Hotel Amenity	3 m^2/person	Profile 'A'
Hotel Bedroom	2 people	Profile 'B'
Kitchen	3 m^2/person	Profile 'C'
Reception	2 people	Profile 'D'
Staff/Office/BOH	12 m^2/person	Profile 'E'
Retail	5 m^2/person	Profile 'F'
CoLiving Amenity	24 people	Profile 'G'
Gym	7.1 m^2/person	Profile 'A'
Metting and Office Room	12 m^2/person	Profile 'E'
CoLiving Bedrooms	2 people	Profile 'B'

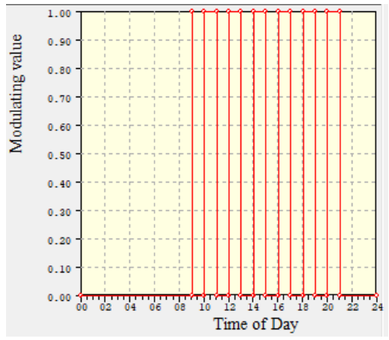

Figure 4 Profile 'A'

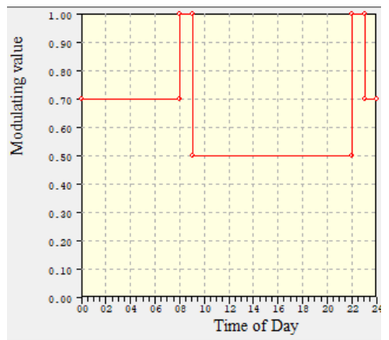

Figure 5 Profile 'B'

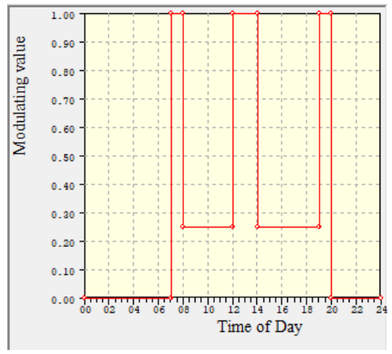

Figure 6 Profile 'C'

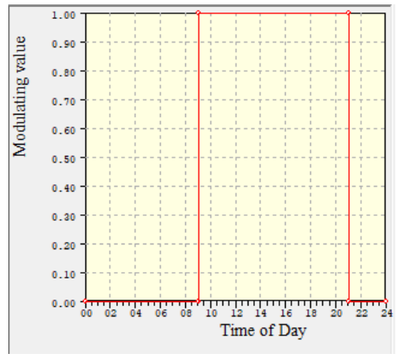

Figure 7 Profile 'D'

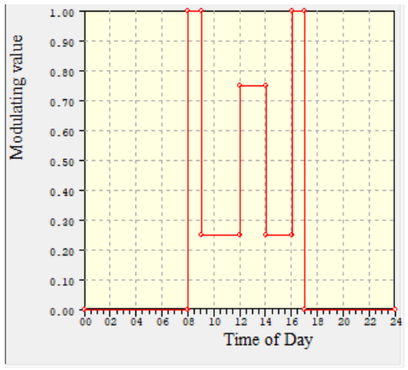

Figure 8 Profile 'E'

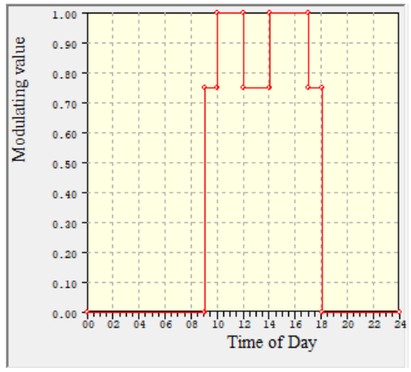

Figure 9 Profile 'F'

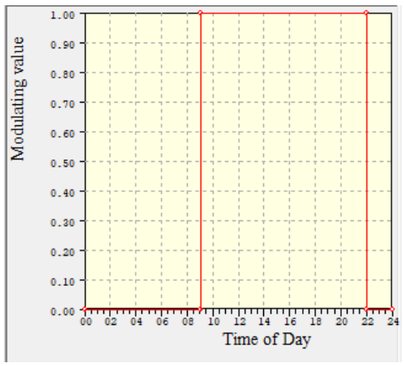

Figure 10 Profile 'G'

Ventilation Rates

The building is largely served by mechanical supply and extract ventilation systems with heat recovery. Below is a summary of the specified ventilation rates applied to the spaces based on CIBSE Guide A recommendations for comfort.

Table 8 Room Level Ventilation Rates on Hotel and CoLiving

SPACE	MAX VENTILATION RATE
Amenity	8 l/s/person
Hotel Bedrooms	8 l/s/person
Kitchen	7.5 l/s/person
Hotel Bathrooms	12 l/s/person
Plant	2ach
Reception	8 l/s/person
Staff/Office/BOH	8 l/s/person
Store	6ach
Public WCs	5ach
Retail	10 l/s/person
Gym	8 l/s/person
Meeting and Office Room	8 l/s/person
CoLiving Bedrooms	10 l/s/person
Laundry	6ach
Comms	6ach
CoLiving Bathrooms	5ach

For the purposes of this assessment, ventilation profiles are linked to space occupancies.

Lighting

High efficiency LED lighting is specified throughout. Lights in communal spaces will be coupled with demand operated lighting where appropriate via daylight diming and absence/presence detection which turns lights off when no occupancy is detected. Maximum lighting loads follows the benchmark allowance in CIBSE Guide A for a Retail Store.

Table 9 Lighting Inputs for Hotel and CoLiving

ROOM GROUPS	LIGHTING CONTROLS	LAMP EFFICACY (LM/W)
Amenity	Auto On/Dimmed	110
Hotel Bedroom/Bathroom	Manual On/ Auto Off	110
Circulation	Auto On/ Auto Off	120
Kitchen	Manual On/Off	130
Gym	Auto On/ Auto Off	130
Meeting + Office	Auto On/Auto Off	130
Plant	Manual On/Off	140
Reception	Auto On/Dimmed	110
Staff/Office/BOH	Auto On/Auto Off	130
Store	Hotel: Auto On/Auto Off CoLiving: Manual On/Off	140
Co-Living Bedrooms/Bathrooms	Manual On/ Auto Off	110
Public WCs	Auto On/Auto Off	120
Laundry	Auto On/Auto Off	130
Car Park	Auto On/ Auto Off	140
Retail	Auto On/Dimmed	100
Server	Manual On/Off	120
Cycle Store	Auto On/ Auto Off	140

Internal Equipment

Allowance have been made for the estimated use of internal equipment within the Hotel and the CoLiving spaces. These have been based on CIBSE Guide A benchmark allowances. A summary of the equipment inputs is presented in the table below.

Table 10 Internal Equipment Loads for Hotel and CoLiving

SPACE TYPES	MAXIMUM EQUIPMENT LOAD
Hotel Amenity	3 W/m^2
Hotel Bedrooms	80 W*
Kitchen	50 W/m^2
Switch Rooms	15 W/m^2
Plant	25 W/m^2
Computer/Telephone Equipment	200 W/m^2
Reception	4.8 W/m^2
Staff/Office/BOH	12 W/m^2
Retail	5 W/m^2
CoLiving Amenity	450 W*
Gym	16.25 W/m^2
Meeting and Office Space	15 W/m^2
CoLiving Bedrooms	80 W*
Laundry	15 W/m^2
Comms Room	50 W/m^2

*Profiles differ from Figure 6-10. Instead, they use CIBSE TM59:2017 “Design methodology for the assessment of overheating risk in homes” Studio profiles.

Lifts

At this stage of the building design, lift energy consumption will be estimated using the default method 3 equation in the Estimating NABERS ratings handbook for apartment buildings.

$$Annual\ energy\ consumption\ (kWh) = 1{,}700\ x\ lift\ floors$$

Where for the CoLiving development, the number of lift floors is 50 and for the Hotel development, the number of lift floors is 17

Therefore, the CoLiving has an annual energy consumption is 85MWh and the Hotel has 28.9MWh

Domestic Hot Water

Estimates for domestic hot water consumption has been made using the CIBSE Guide G: Public Health and Plumbing Engineering for a Hotel (2-star rating) and CoLiving (Flats, medium, privately owned). This usage is linked to occupancy at 9.5 l/(h.pers) for the Hotel and 10.45 l/(h.pers) for the CoLiving.

Photovoltaics

The current strategy is to utilise the PV panels to only offset energy use from the non-domestic elements. Therefore, it has been assumed that the PVs on site have the following performance:

Table 11 PV details for Co-Living Uxbridge

PV FOR CO-LIVING UXBRIDGE	
KWP	65.2 kWp
TOTAL YIELD	49,744 kWh/year
TOTAL M²	285.2 m²
SHADING %	7.6%

4. RESULTS

The results from the dynamic simulation and the supplementary lift energy calculation are presented below.

Table 12 Uxbridge CoLiving TM54 Results

Energy Use	CIBSE Guide F Hotel Benchmark (Good Practice) *	Uxbridge CoLiving (kWh/m2/yr)
Pumps & Fans	20	4.72
Service Water Heating	0	3.36
Space Heating	0**	10.55
Small Power & Other	10	29.16
Cooling	10	2.18
Leisure Pool	5***	0
Catering	23***	0
Lighting	35	5.57
Lifts	0	5.83
Total	**103**	**61.36**

* CoLiving assumed to be compared to the Type 2 Hotel CIBSE Guide F Benchmark due to its similarities with the Hotel.
**Space heating energy usage intensity benchmark to be 15 (kWh/m2/yr) based on the GLA's Table 4 guidance.
***No Leisure Pool or Catering present on the CoLiving

The results presented in Table 12 are presented graphically in Figure 11.

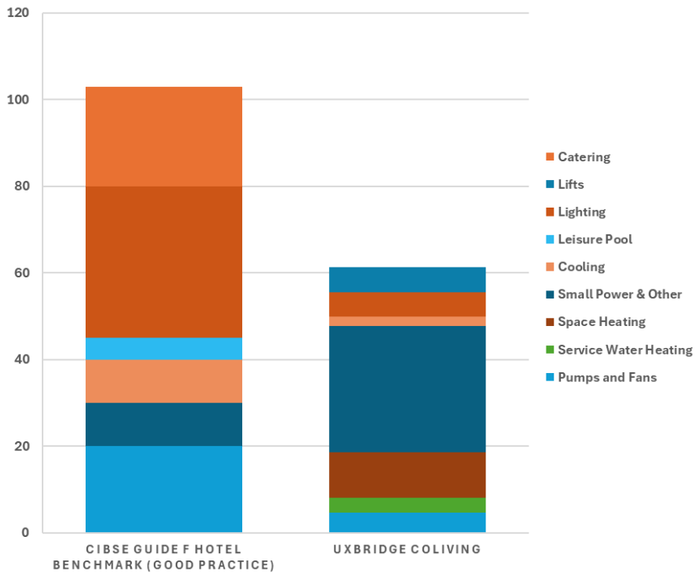

Figure 11 Uxbridge CoLiving TM54 Results

Table 13 Uxbridge Hotel TM54 Results

Energy Use	CIBSE Guide F Hotel Benchmark (Good Practice) *	Uxbridge Hotel (kWh/m2/yr)
Pumps & Fans	20	7.17
Service Water Heating	0	4.77
Space Heating	0**	11.95
Small Power & Other	10	12.93
Cooling	10	3.78
Leisure Pool	5***	0
Catering	23	0.92
Lighting	35	15.06
Lifts	0	4.04
Total	**103**	**60.61**

*Hotel assumed to be compared to the Type 2 Hotel CIBSE Guide F Benchmark.
**Space heating energy usage intensity benchmark to be 15 (kWh/m2/yr) based on the GLA's Table 4 guidance.
***No Leisure Pool present on the Hotel.

The results presented in Table 13 are presented graphically in Figure 12.

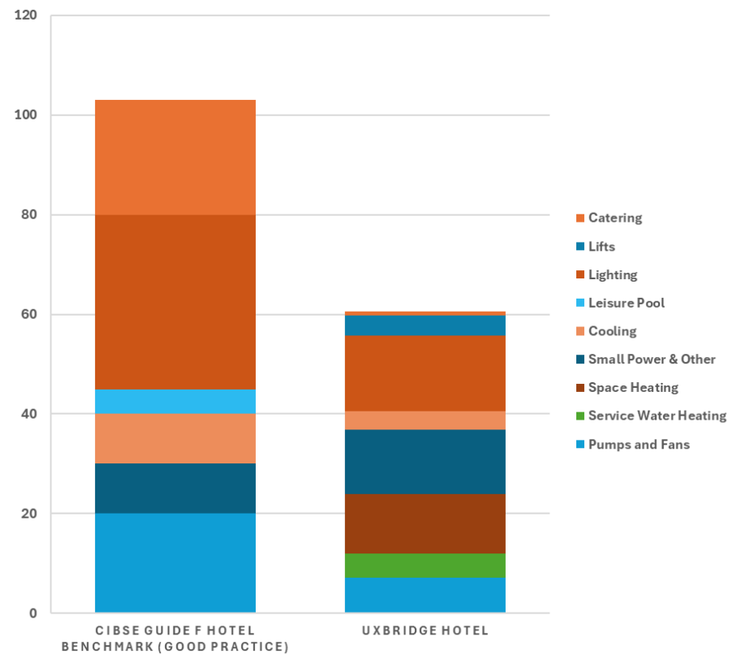

Figure 12 Uxbridge Hotel TM54 Results

Table 14 Baseline TM54 Results

Building Type		Total Predicted	Total Intensity
Hotel	Electricity Usage	433.38 MWh/yr	60.61 kWh/m^2/yr
	Carbon Emissions	63,273.33 $kgCO_2$/yr	8.85 $kgCO_2/m^2$/yr
CoLiving	Electricity Usage	895.08 MWh/yr	61.36 kWh/m^2/yr
	Carbon Emissions	130,681.81 $kgCO_2$/yr	8.96 $kgCO_2/m^2$/yr

To allow useful benchmarking against existing buildings, both developments considered on their own results in the following building energy and carbon performance indicators. CIBSE Guide F benchmarks figures have been used.

Table 15 Benchmark TM54 Results

Building Type		CIBSE Guide F Benchmark (All electric good practice)
Hotel & CoLiving*	Electricity Usage	103 kWh/$m^2_{holiday}$/yr**
	Carbon Emissions	15.04 kgCO_2/yr

*CoLiving assumed to be compared to the Type 2 Hotel CIBSE Guide F Benchmark due to its similarities with the Hotel.
**Type 2 Hotel benchmark used with corrected figures for cooling and ventilation fans, pumps and controls.

Energy consumption values exclude any renewable energy contribution as specified by Part 7.14 in the GLA Energy Assessment Guidance.

5. CONCLUSION

This operational energy report has presented the analysis procedures and results of a TM54 guided assessment of the proposed Uxbridge CoLiving and Hotel development. Due to the stage of the building design, estimates have been made on occupancy and unregulated loads for the purpose of arriving at a suitable energy target for the building. Industry benchmarks have been used to detail the energy modelling inputs and as a comparative tool post assessment.

The TM54 assessment predicted the non-domestic spaces of the development to have an Energy Use Intensity (EUI) of approximately **60.61 kWh/m^2/annum** with space heating amounting to **11.95 kWh/m^2/annum** for the Hotel and approximately **61.36 kWh/m2/annum** with space heating amounting **10.55 kWh/m2/annum** for the CoLiving space**.**

The calculation presented should not be taken as exact prediction of building end energy use rather as a detailed estimate of factors that can affect operational energy.

As a tenant, it is important to maintain any energy efficiency measures expected from the base design. To ensure the ability of the building to achieve it energy targets. These could include a design brief for tenancies that set boundaries on design requirements.

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