

Manchester City Council

Postal Street, Manchester

CIBSE TM54 Operational Energy Analysis Report

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Contents

Executive Summary

1.0 Introduction

- 1.1 The Performance Gap
- 1.2 TM54 Operational Energy Analysis
- 1.3 Software Used

2.0 Building Form & Geometry

- 2.1 Drawings Used
- 2.2 Weather Data
- 2.3 Orientation
- 2.4 Model Geometry

3.0 Construction Data

- 3.1 Opaque Construction Elements
- 3.2 Glazed Construction Elements

4.0 Room Data

- 4.1 Room Set Points
- 4.2 Internal Gains
 - 4.2.1 Lighting
 - 4.2.2 Occupancy
 - 4.2.3 Equipment Loads
- 4.3 Infiltration

5.0 Room Profiles

- 5.1 Living Room / Kitchens
- 5.2 Bedrooms
- 5.3 Bathrooms
- 5.4 FM Suite
- 5.5 Common Corridor & Lobby areas
- 5.6 Stairwell
- 5.7 Front of House / Entrance

- 5.8 Comms Room
- 5.9 WC
- 5.10 Plant Room
- 5.11 Commercial
- 5.12 Refuse, Cycle and Cleaners Store

6.0 Miscellaneous Equipment Loads

- 6.1 Lifts Energy
- 6.2 Security Systems
- 6.3 Server Room
- 6.4 Fire Alarm Systems
- 6.5 External Lighting
- 6.6 Domestic Cold Water Boosting

7.0 HVAC System Details

- 7.1 HVAC Systems Requirements
- 7.2 Heating & Cooling
- 7.3 Domestic Hot Water
- 7.4 Ventilation

8.0 Renewable Technologies

- 8.1 Solar PV

9.0 Results Summary

- 9.1 PV
- 9.2 Total Electrical Use
- 9.3 HVAC Electrical Usage
- 9.4 Proportional Split of Energy Use

Executive Summary

Policy JP-S2: 'Carbon and Energy of the Greater Manchester Combined Authority's Places for Everyone Joint Development Plan' sets an ambitious target which from 2025 requires that all new developments are net zero in terms of operational carbon emissions unless it can be demonstrated that it is not practicable or financially viable. As of 2025, it is an additional requirement that any residual carbon emissions that cannot be mitigated on-site by renewable electricity generation should be offset.

Target trajectory is expected to be in line with 2025 Future Homes Standard which is yet to be released, and net zero carbon is as defined in the UK GBC Framework.

Alignment with net zero operational carbon targets is determined by a building's energy performance and expressed in terms of its energy use intensity (EUI).

The whole building has been modelled based on the planning proposal and building specifications subject to viability. The thermal model shows the operational energy result (i.e. including both regulated and unregulated energy) to be 42.68 kWh/m²(GIA)/yr, this includes the impact of energy generated and utilised on site.

The scheme has been designed using a fabric first approach and following the principles of the Future Homes Standard beta version (*now withdrawn*). The fabric first approach is based on an improved the performance of the building envelope and systems beyond current building regulations.

The 2021 update to Building Regulations Part L (Conservation of fuel and power) aimed to improve energy efficiency in new dwellings, with a focus on reducing carbon emissions by 31 % for dwellings.

The modelled results for apartments under Building Regulations Part L 2021 have been shown to demonstrate a 73.20 % improvement over the target emission rate (TER) as set by Part L 2021.

The summary table below demonstrates results of the dynamic simulation modelling undertaken.

Table 1 – Predicted Operational Energy & Carbon Emissions

Results Summary	
Total Residential Gross Internal Area (GIA m ²)	7,375.63
Total Landlords Gross Internal Area (GIA m ²)	2,042.40
Total Commercial Gross Internal Area (GIA m ²)	774.13
Total Building Gross Internal Area (GIA m ²)	10,192.16
Operational Energy associated with Residential Areas (kWh/yr)	339,988.30
Operational Energy associated with Residential Areas (kWh/m ₂ (GIA)/yr)	46.10
Operational Energy associated with Landlords Areas (kWh/yr)	103,496.40
Operational Energy associated with Landlords Areas (kWh/m ₂ (GIA)/yr)	50.67
Operational Energy associated with Shell Commercial Area (kWh/yr)	29,292.10
Operational Energy associated with Shell Commercial Area (kWh/m ₂ (GIA)/yr)	37.84
Total Operational Energy before offsetting renewables (kWh/yr)	472,776.80
Total Operational Energy before offsetting renewables (kWh/m ₂ (GIA)/yr)	46.39
Energy Generated and utilised from renewable sources (kWh/yr)	37,725.33
Total Operational Energy after offsetting renewables (kWh/yr)	435,051.47
Total Operational Energy after offsetting renewables (kWh/m ₂ (GIA)/yr)	42.68
Total CO ₂ Emissions after offsetting renewables (kgCO ₂ /year)	60,572

*GIA = Simulated Model Area from Dynamic Thermal Model

1.0 Introduction

This energy study has been prepared to demonstrate the predicted operational energy consumption and associated carbon emissions for the proposed Postal Street development based in Manchester.

The report summarises the thermal modelling undertaken to assess how the building performs based on the proposed M&E strategy for both residential and non-residential areas. It predicts the operational energy consumption and carbon emissions, with a view to minimising carbon emissions from regulated and unregulated energy sources in accordance with MCC Planning Policy JP S2: Carbon and Energy of the Greater Manchester Combined Authority's Places for Everyone Joint Development Plan.

1.1 The Performance Gap

All new buildings in the UK are required to demonstrate compliance with Part L of the Building Regulations, which provides a comparison between a proposed and a 'notional' building.

The 'notional' building has the same geometry and services as the proposed building; however, it includes a fixed set of standard criteria with regards to glazing areas, u-values, plant efficiencies and services strategies. These are defined in the NCM.

The Part L software tools utilise a set of NCM templates for standard inputs based on the building type and room activity type i.e. occupancy densities; hours of operation; internal temperatures; domestic hot water use; air flow rates; lux levels. There is an allowance for equipment gains to calculate heating and cooling demands, however, these other energy uses, e.g. servers, external lighting, lifts etc. are not included in the final results.

Initially released in 2013 and updated in 2022, the CIBSE:TM54 Evaluating operational energy performance of buildings at design stage methodology utilises dynamic simulation modelling (DSM) to evaluate the complex systems included in the Part L assessment as 'regulated' energy. These systems are adjusted to reflect the proposed operational profiles of the 'real' building:

- Heating
- Cooling
- Ventilation & Pumps
- Domestic hot water
- Internal lighting
- Humidification

In addition to the 'regulated' energy uses above a more detailed assessment of overall energy use is provided by TM54. A set of calculations based on industry best practice and benchmarks are utilised for the following services:

- External lighting
- Lifts & escalators
- Small power
- Catering
- Server rooms

TM54 is a methodology for non-domestic buildings, and while this assessment doesn't strictly follow TM54 in relation to benchmarking due to the development being mostly domestic, the modelling carried out in is line with the methodology.

1.2 TM54 Operational Energy Analysis

CIBSE TM54: Evaluating Operational Energy Performance of Buildings at the Design Stage. Follows a 17-step process (shown in Figure 1) of modelling all energy consumption by assessing the operating building in as much detail as possible at the relevant Design Stage.

The TM54 methodology is intended to align the building usage more accurately, gaining a more detailed understanding of the building design and operation in use.

As a buildings operation in use is unpredictable, there is an inevitable element of margin required in the building's operation and subsequent anticipated energy consumption.

TM54 sets out how the anticipated operational energy for the building can be estimated. The assessment includes regulated energy such as lighting, heating, ventilation and cooling and provision of hot water, and also considers unregulated energy associated with loads such as: lifts and escalators, small power loads, catering, server rooms and other miscellaneous plant and equipment.

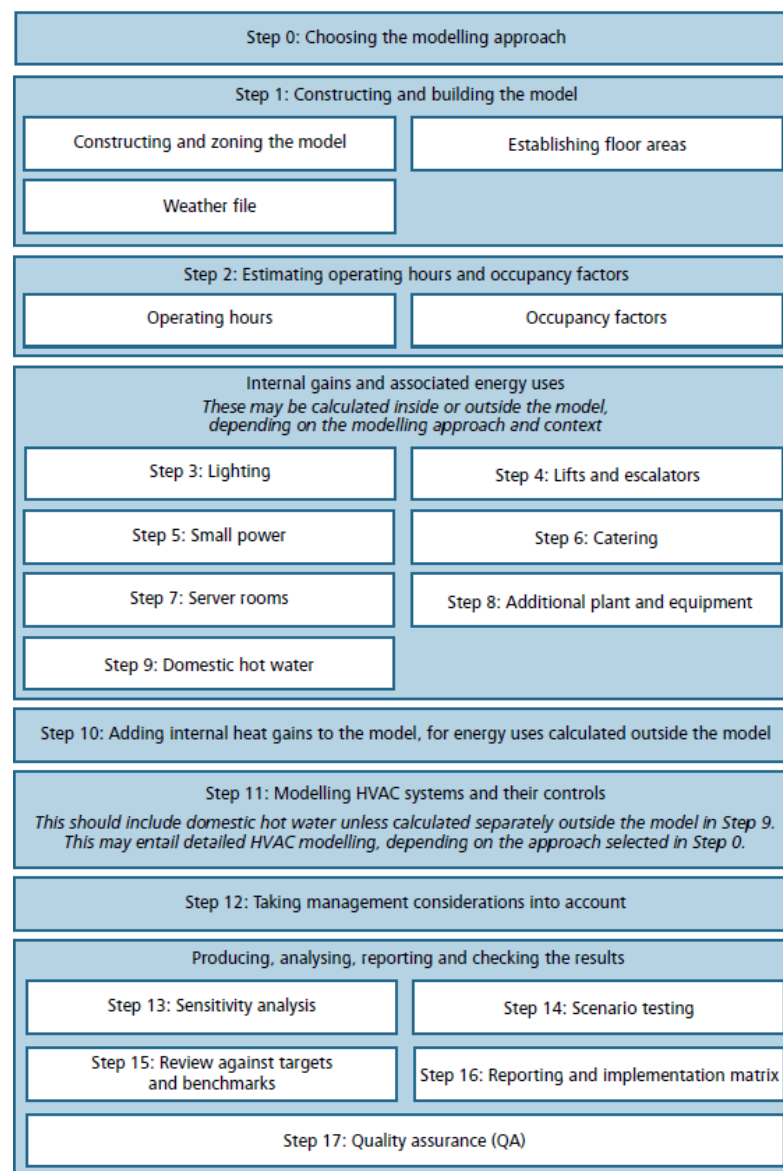


Figure 1 –The methodology used for predicting operational energy consumption.

Note: Steps 13 and 14 are not included, as the base case model only is being considered for operational energy.

1.3 Software Used

A dynamic simulation model (DSM) was created using IES Virtual Environment (2025) to assess the overall annual operational energy for the building. The following sections of the report detail the inputs used to perform the analysis and present the results from the dynamic simulation modelling.

Dynamic simulation provides an estimate of performance. This estimate is based on simplifications that do not and cannot fully represent all the intricacies of performance once built. Simulation results only represent an interpretation of the potential performance. Beyond these modelling challenges and limitations, many other factors will impact energy usage in operation such as the quality and workmanship with construction works, the nature of the different users within the building, the quality of the building operator's operation and maintenance regime and the weather. As a result, no guarantee or warrantee of performance in practice can be based on simulation results alone.

2.0 Building Form & Geometry

The development has been modelled based upon the AutoCAD drawings provided by the Architect.

Table 2 – Architects Design Information

File Reference	Drawing Name	Date Received
POST-HBA-SW-00-DR-A-200100	Proposed Floor Plan - Levels 00	14/10/2025
POST-HBA-SW-ZZ-DR-A-200101	Proposed Floor Plan – Levels 01-06	14/10/2025
POST-HBA-SW-RF-DR-A-200108	Proposed Roof Plan	14/10/2025
POST-HBA-SW-ZZ-DR-A-200200	Proposed Postal Street Elevation	22/10/2025
POST-HBA-SW-ZZ-DR-A-200201	Proposed Dean Street Elevation	22/10/2025
POST-HBA-SW-ZZ-DR-A-200202	Proposed Faraday Street Elevation	22/10/2025
POST-HBA-SW-ZZ-DR-A-200203	Proposed Newton Street Elevation	22/10/2025
POST-HBA-SW-ZZ-DR-A-200204	Proposed West Courtyard Elevation	22/10/2025
POST-HBA-SW-ZZ-DR-A-200205	Proposed East Courtyard Elevation	22/10/2025

2.1 Model Images

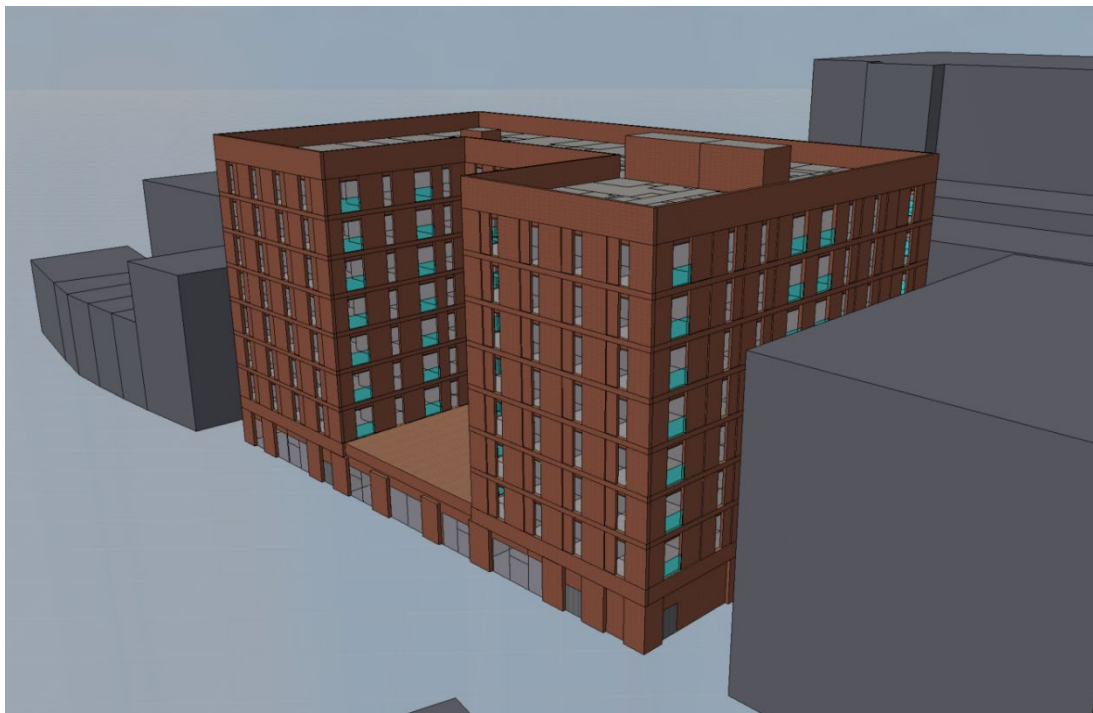


Figure 2 – Building Model – East Elevation

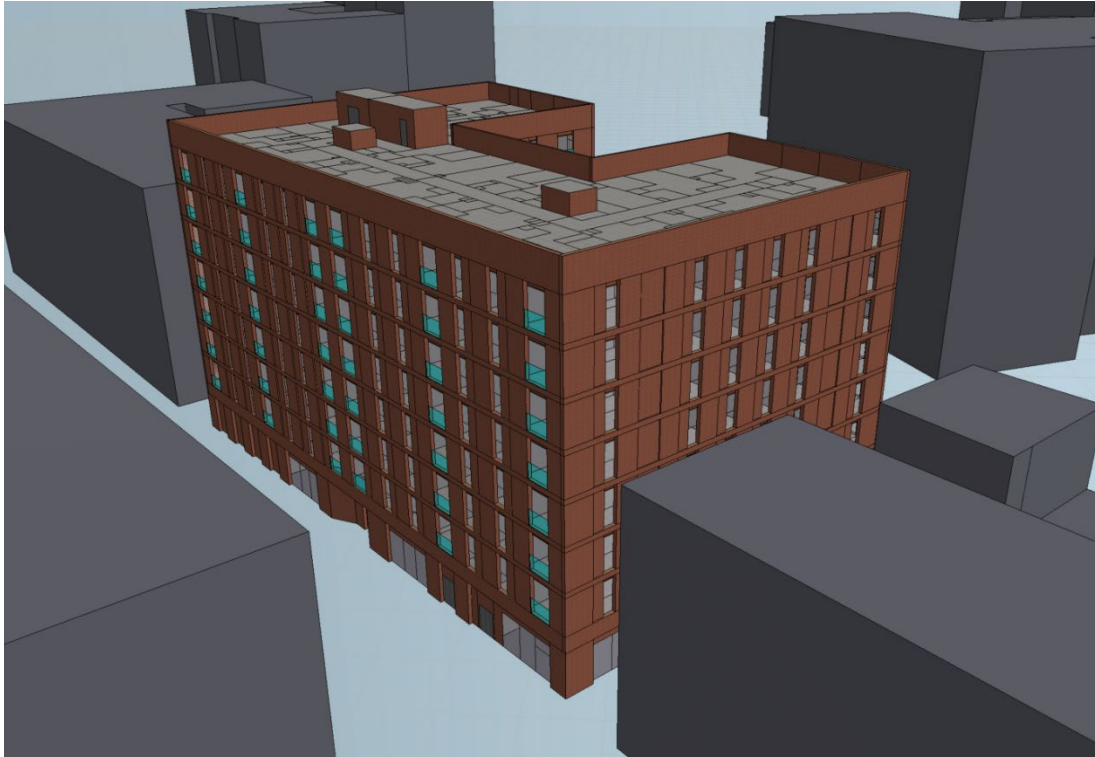


Figure 3 – Building Model – West Elevation

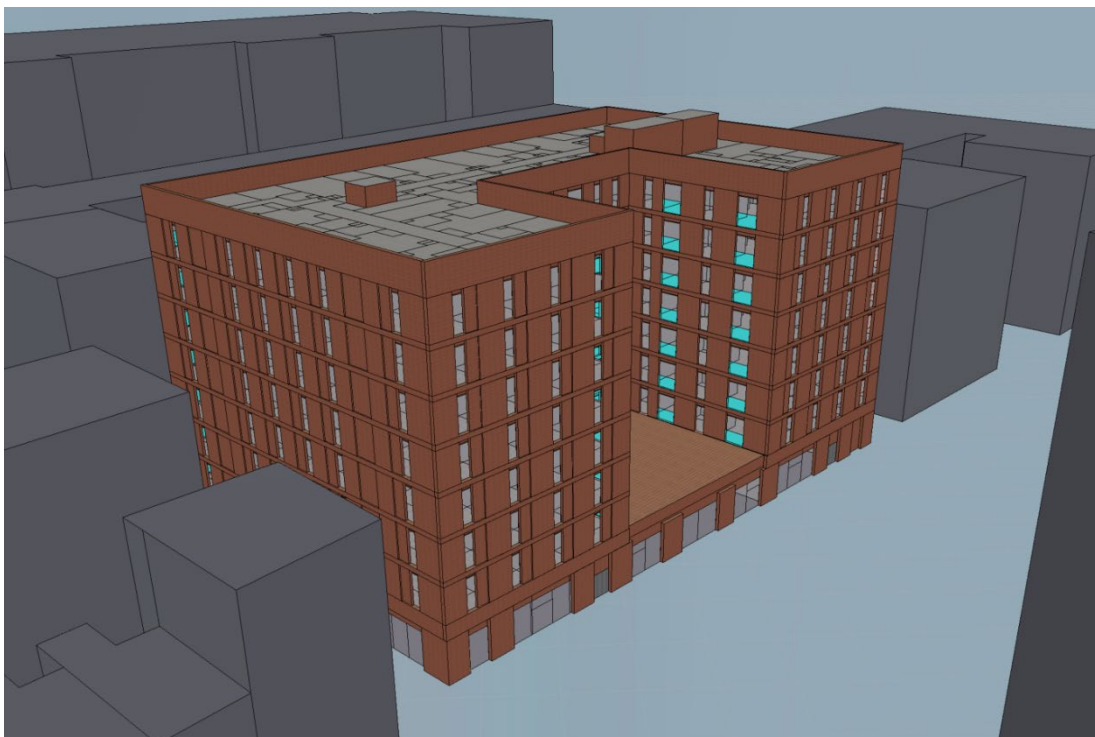


Figure 4 – Building Model – South Elevation

2.2 Weather Data

The building is located in Manchester City Centre and the “Manchester2016.epw” weather file was used for the purpose of the analysis.

The Simulation model is used to calculate the operational performance of the building in response to its external environment (e.g. weather) and internal loads (e.g. occupants and equipment). A suitable weather file must therefore be selected and overlaid onto the model for the energy assessment.

Location & Site Data | Design Weather Data | Simulation Weather Data | Simulation Calendar

Location Data

Location:

Latitude (°):

Longitude (°):

Elevation (m):

Time zone: (hours ahead of GMT)

Daylight saving time

Time adjustment (hours):

From: Through:

Adj. for other months:

Site Data

Ground reflectance:

Summer: Winter:

From: Through:

Terrain type method:

Terrain type:

Ext CO2 Concentration: ppm

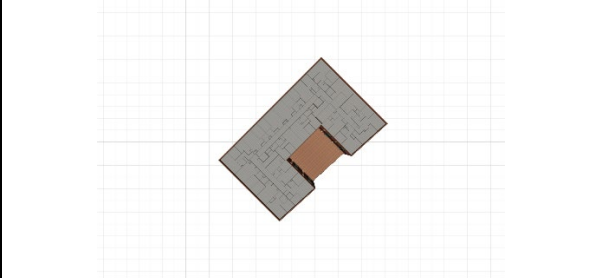
Wind exposure: (for CIBSE Heating Loads)

Reference air density: kg/m³ ☒ Standard ☐ Custom ☐ Derived

2.3 Orientation

The site orientation has been taken from the Architects’ information listed within Section 2.0, with North set at 315° within the IES software. The building site plan in the VE model and the architectural site plan are shown in the table below.

Table 3 – Site Orientation

Model	Site
	

2.4 Model Geometry

The creation of the buildings geometry model, as recommended in the BSRIA BG48:2013 A Guide to Thermal Modelling, uses the conventions detailed in the National Calculation Methodology (NCM) modelling guide (for buildings other than dwellings in England).

Following this convention, the floor area of a zone is calculated using the internal horizontal dimensions between the internal surfaces of the external zone walls and half-way through the thickness of the internal zone walls.

It therefore results in an inevitability that a discrepancy between the floor areas from the architects take offs and those in the model. The following table summarises the comparison:

Table 4 – Floor Area Comparison

Actual GIA (m ²)	As Modelled GIA (m ²)
11,772	10,192

For the purposes of reporting, using area weighted result (Energy/m² or Carbon/m²), the modelled GIA referred to as SMA (simulated model areas) shall take precedence and all tabulated results relate to these areas.

3.0 Construction Data

The following fabric specification has been assigned in the model, which has been reviewed and confirmed with the Architect.

3.1 Opaque Construction Elements

The table below presents the opaque construction properties used in the TM54 model.

Table 5 – Fabric Specification

Opaque Construction Element	U-value (W/m ² .K)
Roof	0.11
External Wall	0.15
Walls between Heated and Unheated Stairwell	0.26
Walls between Heated and Unheated Lift Shaft	0.26
Ground and Exposed Floor	0.12
Heated to Unheated Floor	0.12
External Solid Personnel Doors	1.00

3.2 Glazed Construction Elements

The table below presents the construction properties used in the TM54 model for vision/glazed elements

Table 6 – Glazing Specification

Vision / Glazed Construction Elements	Proposed Design	
	Windows	Glazed Doors
Type	Triple Glazing	Triple Glazing
Whole Unit U-value (W/m ² K)	0.80	0.80
Proposed G-value	0.35	0.35
Proposed L _T	0.70	0.70

4.0 Room Data

The below details the modelled internal building operation setup including set-points, internal gains etc within the spaces.

The IES software allows each room within the model to be allocated an activity from the National Calculation Method (NCM) via room-type templates. The room type template assigned determines the internal gains, usage profiles, temperature set-points and ventilation rates from those contained within the NCM activity. NCM templates and profiles have generally been used in the model.

4.1 Room Set Points

The following table illustrates the Heating and Cooling temperature set point assigned within each zone:

Table 7 – Room Temperature Set Points

Activity Reference	Heating Set Point		Cooling Set Point	
	Occupied	Unoccupied	Occupied	Unoccupied
Living Room / Kitchen	21°C	12°C	-	-
Bedroom	21°C	12°C	-	-
Bathroom / En-suite	22°C	12°C	-	-
Utility Cupboard	-	-	-	-
Common Corridor	-	-	-	-
Front of House / Entrance	21°C	12°C	24°C	-
FM Suite	21°C	12°C	24°C	-
WC	19°C	12°C	-	-
Lobby areas	-	-	-	-
Refuse Store	5°C	5°C	-	-
Cycle Store	5°C	5°C	-	-
Mechanical Plant Room	5°C	5°C	-	-
Comms Room	18°C	18°C	19°C	19°C
Commercial	20°C	12°C	23°C	-
Stairwell	-	-	-	-
Lift Shaft	-	-	-	-
Risers	-	-	-	-
Commercial Unit(s)	-	-	-	-

Note – Unoccupied setpoints are setback temperatures.

4.2 Internal Gains

The following section outlines the modelled room internal gains for each room activity.

4.2.1 Lighting

The lighting power density has been specified in the simulation model. The design values indicated are peak loads. All rooms have individual diversity profiles assigned as per the building profiles section.

Table 8 – Lighting Efficiencies

Activity Reference	Design illuminance (lux)	Lamp Efficacy (lm/W)	Lighting Power Density (W/m ² /100lux)	Daylight Lighting Control
Living Room / Kitchen	200	115	1.50	No
Bedroom	100	115	1.67	No
Bathroom / En-suite	150	115	2.19	No
Utility Cupboard	100	115	3.88	No
Common Corridor	100	125	1.60	No
Front of House / Entrance	200	115	1.32	No
FM Suite	300	115	2.05	No
WC	150	115	3.46	No
Lobby areas	200	125	1.57	No
Refuse Store	100	115	1.80	No
Cycle Store	100	115	1.80	No
Cleaners Store	100	115	1.80	No
Mechanical Plant Room	200	130	1.51	No
Comms Room	200	130	1.51	No
Commercial	300	115	1.31	Yes
Stairwell	100	125	1.60	No
Lift Shaft	-	-	-	-
Risers	-	-	-	-
Commercial Unit(s)	-	-	-	-

4.2.2 Occupancy

The below table details the occupant density - the design values indicated is peak occupancy.

Table 9 – Occupancy Density

Activity Reference	Occupancy
Living Room / Kitchen	1-4 people
Double Bedroom	1-2 people
Bathroom / En-suite	1 person
Utility Cupboard	-
Common Corridor	1 person / 8.7m ²
Front of House / Entrance	1 person / 10m ²
FM Suite	1 person / 10m ²
WC	1 person / 8.5m ²
Lobby areas	1 person / 8.7m ²
Refuse Store	1 person / 9.1m ²
Cycle Store	1 person / 9.1m ²
Mechanical Plant Room	1 person / 9.1m ²
Comms Room	1 person / 9.1m ²
Commercial	1 person / 8.6m ²
Stairwell	1 person / 8.7m ²
Lift Shaft	-
Risers	-
Commercial Unit(s)	-

4.2.3 Equipment

The equipment loads have been specified in the simulation model as summarised below. The design values indicated are peak loads.

Table 10 – Equipment Loads

Activity Reference	Equipment	
	Max Power Consumption	Max Sensible Gain
Living Room / Kitchen	377 - 618 W	341 - 519 W
Bedroom	20.9 - 32.5 W	20.9 - 32.5 W
Bathroom / En-suite	2.46 W	2.46 W
Utility Cupboard	-	-
Common Corridor	1.22 W/m ²	1.22 W/m ²
Front of House / Entrance	4.72 W/m ²	4.72 W/m ²
FM Suite	12.70 W/m ²	12.605 W/m ²
WC	5.34 W/m ²	5.34 W/m ²
Lobby areas	-	-
Refuse Store	-	-
Cycle Store	-	-
Mechanical Plant Room	10 W/m ²	10 W/m ²
Comms Room	20 W/m ²	20 W/m ²
Commercial	5.20 W/m ²	5.20 W/m ²
Stairwell	1.22 W/m ²	1.22 W/m ²
Lift Shaft	-	-
Risers	-	-
Commercial Unit(s)	-	-

4.3 Infiltration

A target air permeability is assumed as tabulated below to calculate an infiltration rate. The air permeability is based on the average volume of air that passes through one square meter of the building envelope when subject to a 50 Pascal pressure difference across the building structure. Furthermore, this equates to an approximate infiltration value also tabulated below.

CIBSE recommend that in the absence of the building airflow characteristics that the air infiltration rate be based on empirical data as provided in CIBSE Guide A. The relevant conversions are provided in the table below:

Table 11 – Air Infiltration

Building Zone Reference	Design Air Permeability	Calculated Infiltration
All Building Zones	1.00 m ³ /hr/m ² @50Pa	0.0174 l/s/m ² .facade

5.0 Room Profiles

The following room profiles were used in the calculations.

5.1 Living Room / Kitchens

Table 12 – Typical Living Room / Kitchen Profiles

Time Period	Occupancy	Lighting	Equipment
0000 - 0600	0%	0%	8.2%
0600 - 0700	25%	0%	31.1%
0700 - 1000	100%	100%	50%
1000 - 1600	0%	0%	8.2%
1600 - 1800	50%	0%	53.2%
1800 - 1900	100%	0%	100%
1900 - 2200	100%	100%	100%
2200 - 2300	66.7%	100%	68.8%
2300 - 2400	0%	0%	8.2%

5.2 Bedrooms

Table 13 – Typical Bedroom Profiles

Time Period	Occupancy	Lighting	Equipment
0000 - 0700	100%	0%	7%
0700 - 0800	50%	100%	53.5%
0800 - 0900	25%	100%	100%
0900 - 1000	0%	100%	53.5%
1000 - 1700	0%	0%	7%
1700 - 1800	0%	0%	30.2%
1800 - 1900	0%	0%	53.5%
1900 - 2000	0%	100%	76.7%
2000 - 2200	0%	100%	100%
2200 - 2300	25%	100%	76.7%
2300 - 2400	75%	0%	30.2%

5.3 Bathrooms

Table 14 – Typical Bathroom Profiles

Time Period	Occupancy	Lighting	Equipment
0000 - 0600	0%	0%	6%
0600 - 0700	0%	0%	29.5%
0700 - 0900	100%	100%	100%
0900 - 1000	100%	100%	29.5%
1000 - 1800	0%	0%	3%
1800 - 1900	0%	0%	53%
1900 - 2100	20%	100%	100%
2100 - 2200	20%	100%	34.2%
2200 - 2300	20%	100%	6%
2200 - 2400	0%	0%	6%

5.4 FM Suite

Table 15 – Typical FM Suite Profiles

Time Period	Occupancy	Lighting	Equipment
0000 - 0700	0%	0%	5%
0700 - 0800	25%	100%	100%
0800 - 0900	50%	100%	100%
0900 - 1200	100%	100%	100%
1200 - 1400	75%	100%	100%
1400 - 1700	100%	100%	100%
1700 - 1800	50%	100%	100%
1800 - 1900	25%	100%	100%
1900 - 2000	0%	0%	100%
2000 - 2400	0%	0%	5%

5.5 Common Corridor & Lobby areas

Table 16 – Typical Common Corridor & Lobby areas Profiles

Time Period	Occupancy	Lighting	Equipment
0000 - 0700	0%	0%	5%
0700 - 2300	30%	40%	100%
2300 - 2400	30%	40%	33.5%

5.6 Stairwell

Table 17 – Typical Stairwell Profiles

Time Period	Occupancy	Lighting	Equipment
0000 - 0700	0%	0%	5%
0700 - 2300	30%	40%	100%
2300 - 2400	30%	40%	33.5%

5.7 Front of House / Entrance

Table 18 – Typical Front of House / Entrance Profiles

Time Period	Occupancy	Lighting	Equipment
0000 - 0700	0%	0%	5.3%
0700 - 2300	100%	100%	100%
2300 - 2400	30%	100%	33.7%

5.8 Comms Room

Table 19 – Typical Comms Room Profiles

Time Period	Occupancy	Lighting	Equipment
0000 - 0700	0%	0%	9.5%
0700 - 0900	0%	0%	100%
0900 - 1700	1%	100%	100%
1700 - 2000	0%	0%	100%
2000 - 2400	0%	0%	9.5%

5.9 WC

Table 20 – Typical WC Profiles

Time Period	Occupancy	Lighting	Equipment
0000 - 0700	0%	0%	4.7%
0700 - 2100	100%	100%	100%
2100 - 2400	0%	0%	4.7%

5.10 Plant Room

Table 21 – Typical Plant Room Profiles

Time Period	Occupancy	Lighting	Equipment
0000 - 0900	0%	0%	100%
0900 - 1700	1%	5%	100%
2100 - 2400	0%	0%	100%

5.11 Commercial

Table 22 – Typical Commercial Profiles

Time Period	Occupancy	Lighting	Equipment
0000 - 0800	0%	0%	4.8%
0800 - 0900	0%	0%	100%
0900 - 1000	75%	100%	100%
1000 - 1200	100%	100%	100%
1200 - 1400	75%	100%	100%
1400 - 1700	100%	100%	100%
1700 - 1800	75%	100%	100%
1800 - 2400	0%	0%	4.8%

5.12 Refuse, Cycle and Cleaners Store

Table 23 – Typical Refuse, Cycle and Cleaners Store Profiles

Time Period	Occupancy	Lighting	Equipment
0000 - 0700	0%	0%	0%
0700 - 2100	100%	100%	0%
2100 - 2400	0%	0%	0%

6.0 Miscellaneous Equipment Loads

The below types of miscellaneous equipment loads have also been considered to contribute for overall building energy.

6.1 Lifts Energy

It is not possible to model lifts within the advanced simulation energy model therefore a manual assessment of the likely energy usage has been undertaken.

An allowance of 37,825 kWh/annum calculated from the formula below has been included which will be reviewed during the later design stages once selections have been made.

$$E_{lift}(kWh) = (528F + 5.5A)(1 - \alpha)$$

Where: A - the net internal area of the building

α - 0.26 for lifts without regeneration and 0.37 for lifts with regeneration

$$F = \sum_{all\ floors} n$$

Where: n - the number of lifts serving or express bypassing the floor

6.2 Security Systems

Table 24 – Security Systems

Energy Use	Peak Load
Security Systems	8 W

**This is set to ON Continuously profile*

6.3 Server Room

Table 25 – Server Room

Energy Use	Peak Load
Server Room	5 W

**This is set to ON Continuously profile*

6.4 Fire Alarm Systems

Table 26 – Fire Alarm Systems

Energy Use	Peak Load
Fire Alarm Systems	5 W

**This is set to ON Continuously profile*

6.5 External Lighting

It is not necessary to model external lighting within the advanced simulation energy model therefore a manual assessment of the likely energy usage has been undertaken.

An estimated allowance of 1,266 kWh/annum has been calculated and included which will be reviewed during the later design stages once the lighting design has progressed.

6.6 Domestic Cold Water Boosting

The following domestic cold water boosting energy consumption has been applied to the model based on an assumed 10,755 kW rated booster pump set. The final rating of the boosted cold water pump set is to be confirmed during the next stage of design

Table 27 – Domestic Cold Water Booster Set Energy Consumption

Hours of Operating (nr of hours)	Duty Pump Operation	Assist Pump Operation	Annual Energy (kWh/annum)
4415	25%	0%	2,759
2190	25%	25%	2,738
1095	50%	25%	2,053
548	50%	50%	1,369
274	75%	50%	855
136	75%	75%	510
68	100%	75%	299
34	100%	100%	171
8,760			10,755

7.0 HVAC System Types

The following systems have been applied to the model in the appropriate areas of the building. These have been set-up using the Apache application in the IES VE software.

7.1 HVAC System Requirements

Table 28 – HVAC System Requirements

Activity Reference	Heating System	Cooling System	Vent System
Living Room / Kitchen	Electric Panel Heaters	-	MVHR unit
Bedroom	Electric Panel Heaters	-	MVHR unit
Bathroom / En-suite	Electric Towel Rail	-	MVHR unit
Utility Cupboard	-	-	MVHR unit
Common Corridor	-	-	Natural Infiltration
Front of House	VRF System	VRF System	Local HRU
FM Suite	DX Split System	DX Split System	Local HRU
WC	Electric Panel Heater		Local HRU
Lobby areas	-	-	Natural Infiltration
Refuse Store	-	-	Extract Only
Cycle Store	-	-	Natural Infiltration
Mechanical Plant Room	Electric Frost Protection	-	Natural Infiltration
Comms Room	DX Split System	DX Split System	Natural Infiltration
Commercial	VRF System	VRF System	Local HRU
Stairwell	-	-	-
Lift Shaft	-	-	-
Risers	-	-	-
Commercial Unit(s)	-	-	-

7.2 Heating & Cooling

Heating and cooling to the development is delivered in the following ways:

Table 29 – Heating & Cooling Emitter Types

Emitter Type	Seasonal Efficiency
VRF System to Front of House	SCOP 4.50, SEER 6.73
DX Split System to FM Suite	SCOP 3.72, SEER 6.60
DX Split System to Comms Room	SCOP 3.72, SEER 6.60
VRF System to Commercial areas	SCOP 4.50, SEER 6.73
Electric Panel Heaters to Living / Kitchens	100%
Electric Panel Heaters to Bedrooms	100%

7.3 Domestic Hot Water

Hot Water to building is delivered in the following ways:

Table 30 – Domestic Hot Water Emitter Types

Emitter Type	Seasonal Efficiency	Storage	Losses
Apartment ASHP Water Heater	SCOP 3.36	200L per apt	1.61 kWh/day
Acc WC Instant Electric Water Heater	100%	-	-
FM Suite Electric Water Heater	100%	15 L	0.005 kWh/l/day
Commercial Area Electric Water Heater	100%	-	-

7.4 Ventilation

Ground floor amenity areas are provided with heat recovery units based on 10 l/s/p fresh air as per the schedule below.

Apartments are provided with whole house MVHR units delivering Part F minimum flow rates or summer boost rates as required for Approved Document O compliance.

Table 31 – Ventilation Units

Room	Specific Fan Power W/(l.s)	Heat Recovery Rate
Amenity Areas	1.10	80 %
1 Bed Apartment: Vent Axia Econiq M – Kitchen + 1 wet room	0.41	93 %
2 Bed Apartment: Vent Axia Econiq L – Kitchen + 1 wet room	0.56	93 %
2 Bed Apartment: Vent Axia Econiq L – Kitchen + 2 wet room(s)	0.53	93 %

8.0 Renewable Technologies

8.1 Solar PV

Policy JP-S2 of the Greater Manchester Combined Authority Places for Everyone plan (adopted 2024) has been considered which states a minimum photovoltaic installation of 40% of available roof area should be provided.

Based on 40% available roof area this building benefits from the following solar PV generation.

Annual Electricity generated	– 51,023 kWh/year.
Annual Electricity exported	– 13,297 kWh/year.
Annual Electricity generated and utilised	– 37,725 kWh/year.
Utilisation (%)	– 73.9 %

9.0 Results Summary

9.1 PV

The following table and graph demonstrate how the amount of electricity generated by the PV array varies throughout the year.

Table 32 – Photovoltaic Generation by Month

Month	Generation (kWh/month)
January	1,006.40
February	1,976.00
March	3,705.10
April	5,433.30
May	7,570.00
June	7,402.80
July	8,050.00
August	6,627.70
September	4,663.10
October	2,748.10
November	1,068.00
December	772.20

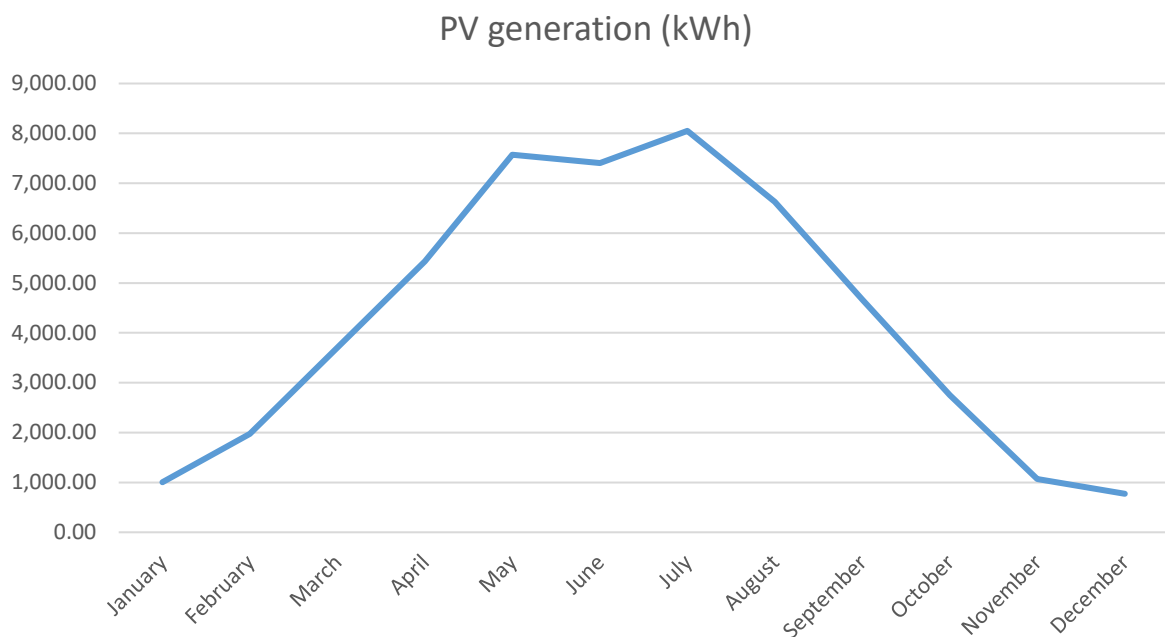


Figure 5 – Photovoltaic Generation by Month

9.2 Total Electrical Use

The two following tables show the split of energy use broken down by each service.

Table 33 – Total Electrical Usage by End Use

End Use	Landlords Areas (kWh/yr)	Residential Areas (kWh/yr)	Commercial Areas (kWh/yr)	Whole Building (kWh/yr)
Interior Lighting	27,038.70	53,730.20	8,892.40	89,661.30
Equipment	21,779.70	204,832.90	15,681.40	242,294.00
Space Heating	1,107.00	1,251.80	406.10	2,764.90
Service Water Heating	237.80	60,160.00	1,341.00	61,738.80
Space Cooling	2,355.20	0.00	1,336.60	3,691.80
Interior Fans	1,014.50	20,013.40	1,634.60	22,662.50
External Lighting	1,226.40	0.00	0.00	1,226.40
Elevators	37,824.60	0.00	0.00	37,824.60
Security System, Server, Fire Alarm	157.70	0.00	0.00	157.70
Cold Water Boosting	10,754.80	0.00	0.00	10,754.80
Whole Building	103,496.40	339,988.30	29,292.10	472,776.80

Table 34 – Electrical Usage by End Use Per m²

End Use	Landlords Areas (kWh/m ² (GIA)/yr)	Residential Areas (kWh/m ² (GIA)/yr)	Commercial Areas (kWh/m ² (GIA)/yr)	Whole Building (kWh/m ² (GIA)/yr)
Interior Lighting	13.24	7.28	11.49	8.80
Equipment	10.66	27.77	20.26	23.77
Space Heating	0.54	0.17	0.52	0.27
Service Water Heating	0.12	8.16	1.73	6.06
Space Cooling	1.15	0.00	1.73	0.36
Interior Fans	0.50	2.71	2.11	2.22
External Lighting	0.60	0.00	0.00	0.12
Elevators	18.52	0.00	0.00	3.71
Security System, Server, Fire Alarm	0.08	0.00	0.00	0.02
Cold Water Boosting	5.27	0.00	0.00	1.06
Whole Building	50.67	46.10	37.84	46.39

9.3 HVAC Electrical Usage

The three following graphs demonstrate how the electrical consumption of the fans and heating and cooling systems varies throughout the year.

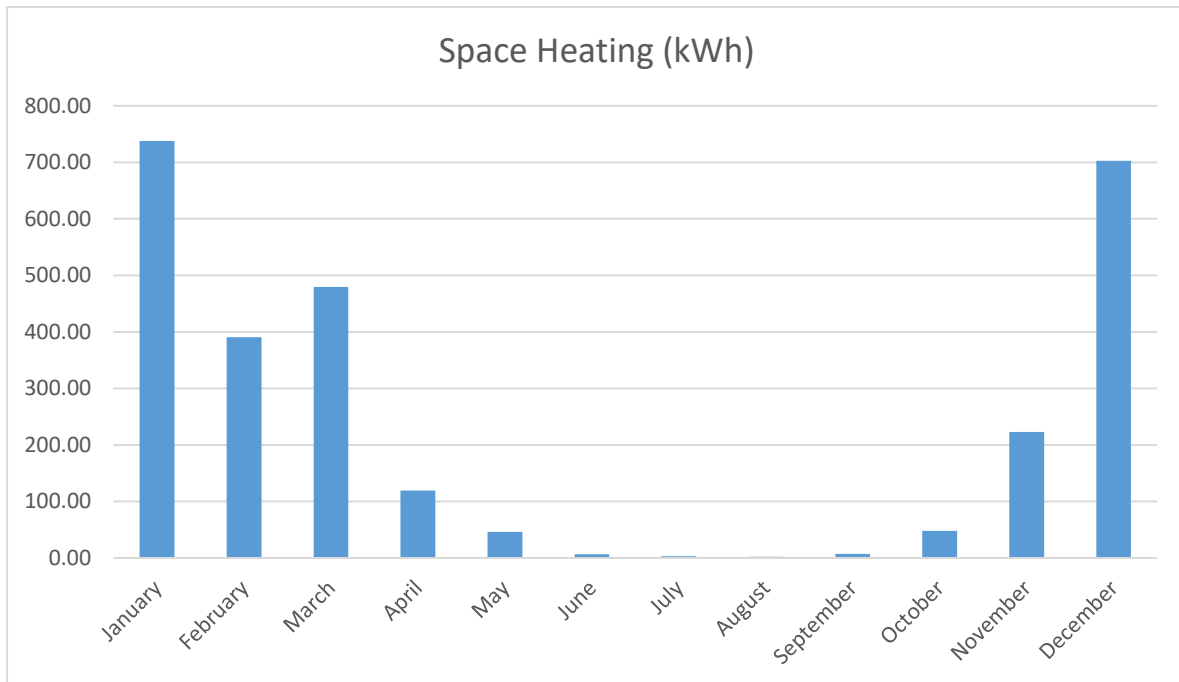


Figure 6 – Monthly Electrical Consumption for Space Heating

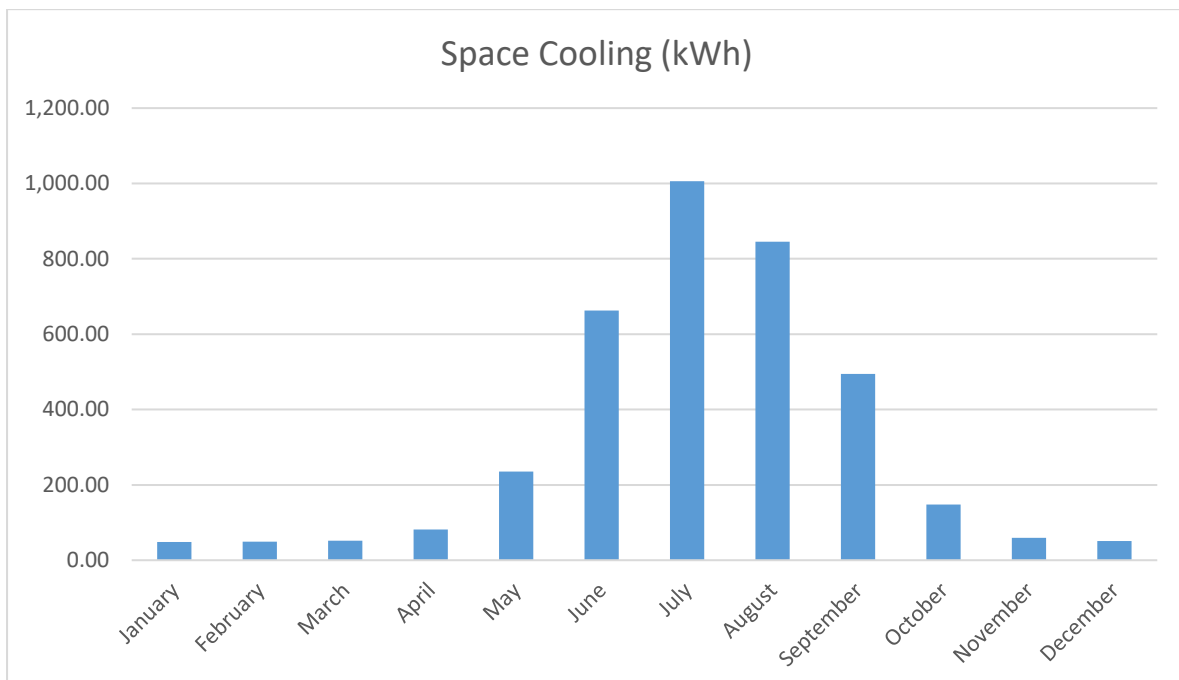


Figure 7 – Monthly Electrical Consumption for Space Cooling

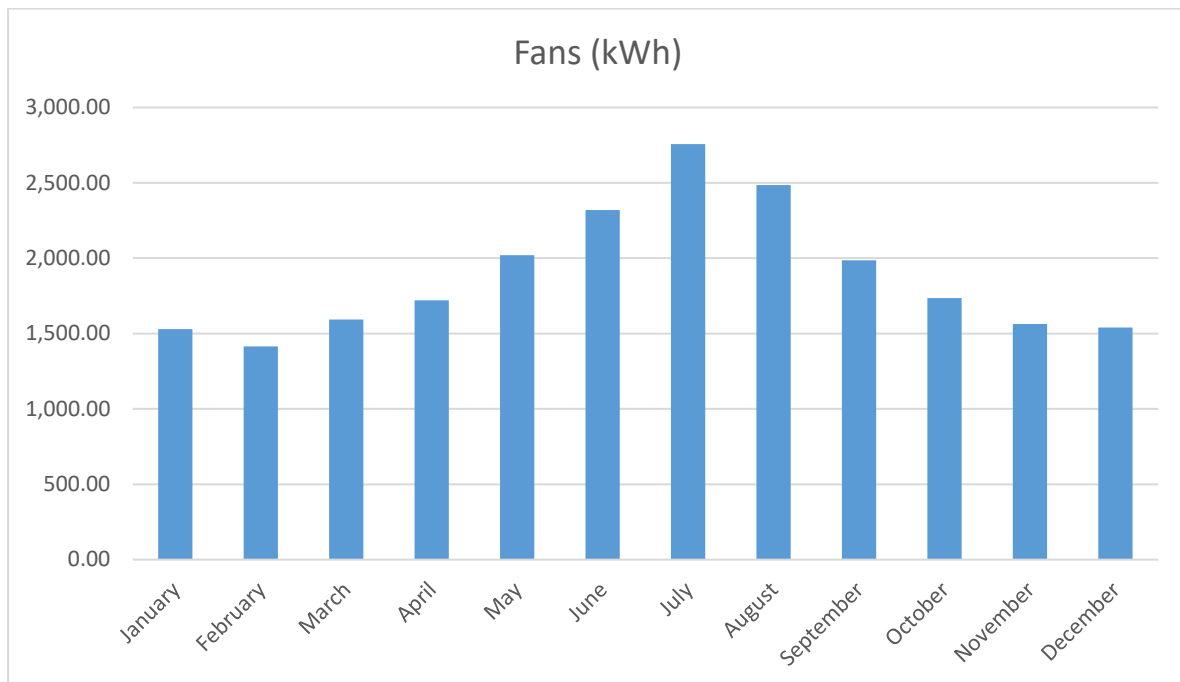


Figure 8 – Monthly Electrical Consumption for Ventilation Fans

9.4 Proportional Split of Energy Use

The three following graphs show the proportion of electrical usage for each end use for the whole building, landlord's areas and residential areas.

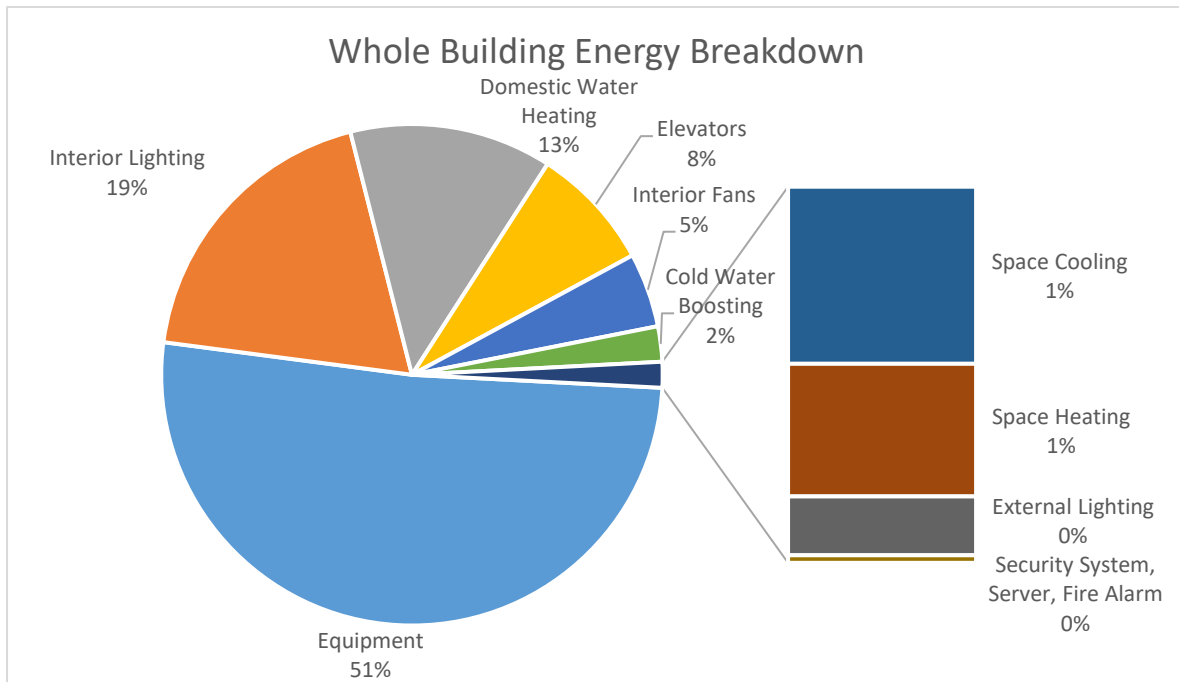


Figure 9 – Electrical Consumption Proportions for the Whole Building

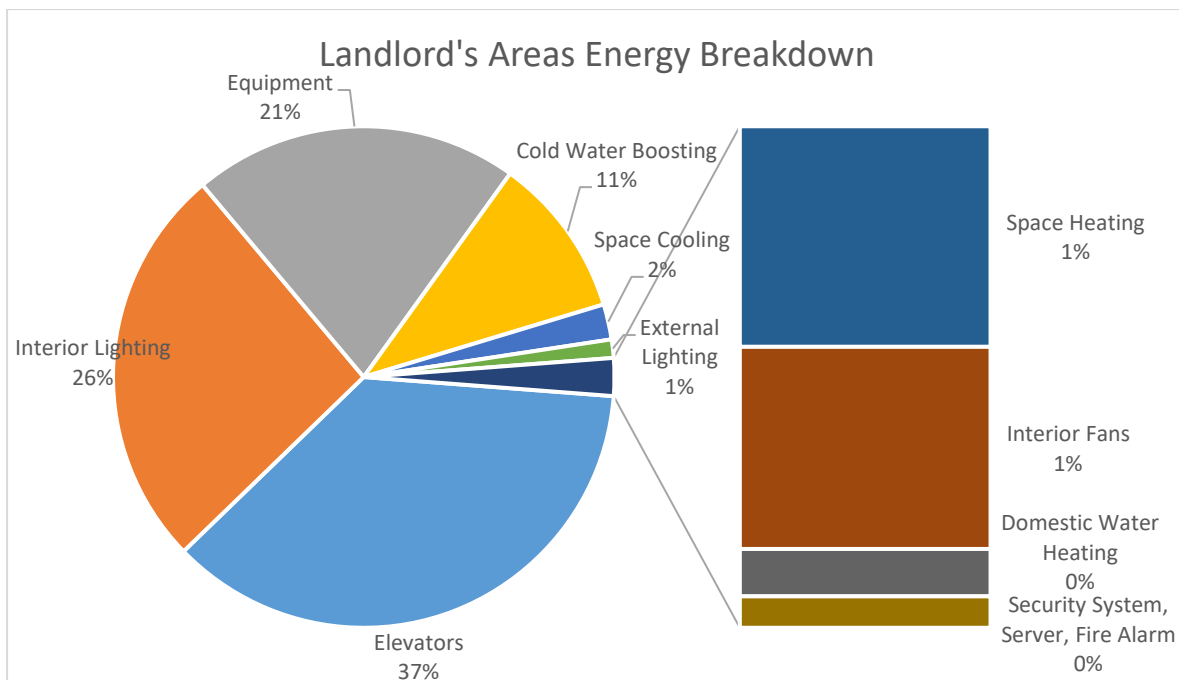


Figure 10 – Electrical Consumption Proportions for the Landlord's Areas

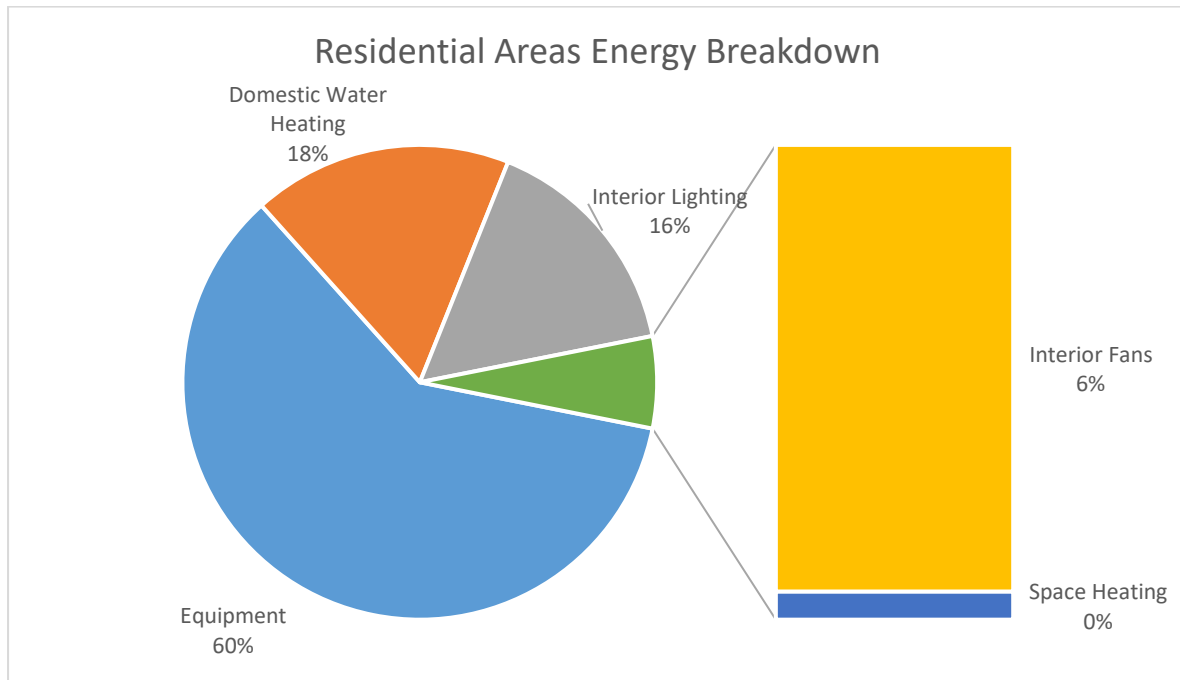


Figure 11 – Electrical Consumption Proportions for the Residential Areas

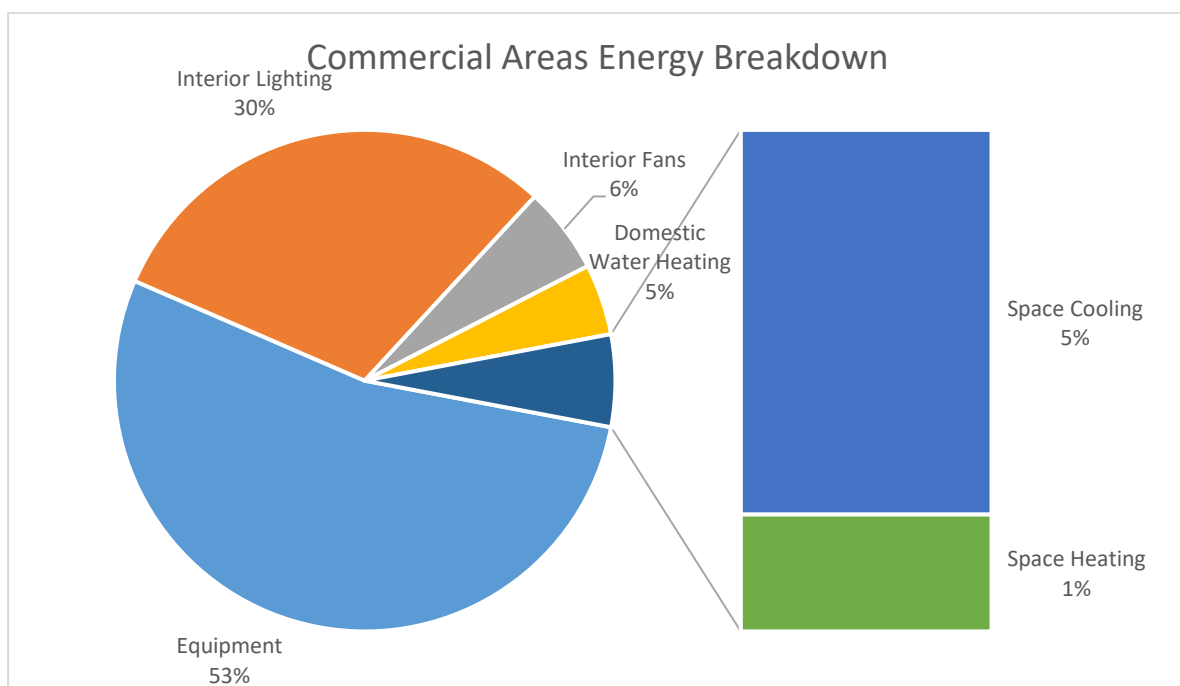


Figure 12 – Electrical Consumption Proportions for the Commercial Areas

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